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TM 690A

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INSTRUCTION MANUAL

DATA QUALITY ANALYZER

DQA-10

ATLANTIC RESEARCH CORPORATION
A Division of The Susquehanna Corporation
TELECOMMUNICATION PRODUCTS DEPARTMENT

ALEXANDRIA, VIRGINIA 22314
USA

TM 690A

Price: $10.00

DATA QUALITY ANALYZER

DQA-10

Applies to Units Having Serial Numbers of the A Series.

June 1972

From the TELEPRODUCT® Line

of the

Telecommunication Products Department

Manufactured by

ATLANTIC RESEARCH CORPORATION
A Division of The Susquehanna Corporation
ALEXANDRIA, VIRGINIA 22314
USA

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Figure 1-1. Distortion Quality Analyzer DQA-10.

SECTION I

GENERAL INFORMATION

The Data Quality Analyzer DQA-10 is a precision instrument for test-center or field use in analysis of start-stop teleprinter and data signals. The DQA-10 makes complete measurement of each appropriate signal bit transition for meter indications in percent of total distortion, bias or end distortion, or speed error at any selected speed up to 2500 baud. Measurements may be peak readings or average distortion. The DQA-10 also measures loop current and EIA or MIL-188 signal voltage. Parity indication and parity errors are monitored in 7- and 8-level codes at speeds up to 50,000 baud.

The DQA-10 and a companion test message generator fit side-by-side into an MR-14 rack adapter in a standard 19-inch relay rack and occupy only 7 inches of vertical mounting space.

Table 1-1. Specifications, DQA-10.

Input Signals Accepted	
Low Impedance:	Neutral, 20 mA* Neutral, 60 mA* Polar, 10-100 mA
High Impedance:	EIA RS-232 MIL-188 Unipolar $\geqq$ 0.5V (rear-panel switch may be set for positive or negative unipolar signals)
Code Level:	5-, 6-, 7-, and 8-level start-stop with start bit = 1.0 unit and stop bit $\geqq$ 1.0 unit
Speed:	
Internally Controlled:	10-50,000 baud up to nine discrete speed selections (see Table 1-2). Each speed controlled by a crystal oscillator. Accuracy ±0.01 percent.
Externally Controlled:	Up to 2500 for metered distortion readings. CLOCK jack allows speed control by external oscillator operating at a frequency in Hz of 400 times the signal speed in baud, 3-25 volts (peak-to-peak) sinusoidal or square-wave into 600 ohms. Up to 50 ,000 baud for parity monitoring. CLOCK jack allows speed control by external oscillator operating at a frequency in Hz of 4 times the signal speed in baud, 3-25 volts (peak-to-peak) sinusoidal or square-wave into 600 ohms.

*Other neutral inputs available on special order.

Table 1-1. Specifications, DQA-10. (Cont'd)

Input Impedance:	
Low Impedance:	60 ohms nonreactive (isolated series connection). Filter switch is provided to suppress effect of relay bounce, adding approximately 0.5 millisecond delay.
High Impedance:	$\geqq$ 10,000 ohms nonreactive
Direct-Reading Meter:	Displays selected measurement with indicated accuracy. Maximum signal speed for distortion and speed measurements is 2500 baud.
Distortion, Total, Bias, or End	0-49 ± 2 percent. Readings may be peak or average. Type of bias and end distortion (marking or spacing) is displayed on indicator lamps located above meter.
Voltage:	-25 volts to +25 volts ±4 percent (center reading) EIA, MIL, or unipolar input signal.
Loop Current:	0-120 milliamperes ±4 percent.
Speed Error:	0-10 ± 0.4 percent. Type of speed error (slow or fast) is displayed on indicator lamps located above meter.
Additional Indicators:	Parity indicator lamps (odd parity and even parity) may be set to follow the parity bit of each 7- or 8-level signal character or may be set to display normal parity and hold parity error indication until reset manually. Maximum signal speed for parity measurement is 50,000 baud.
	Signal indicator lamp (space = on).
Outputs (rear panel):	Output normal condition is +2 volts with respect to GRD terminal.
Even Parity:	0.5 microsecond, minimum, ground signal for each even parity character.
Odd Parity:	0.5 microsecond, minimum, ground signal for each odd parity character.
Character:	0.5 microsecond, minimum, ground signal for each received character. Pulse occurs during received character stop pulse and may be used to synchronize external equipment.
Power Requirements:	115 or 230 volts ac ±10 percent 50-60 Hz, 20 watts
Size:	9 1/2 (wide) by 6 5/8 (high) by 12 5/8 (deep) inches, including handle and cover.
Weight:	10 1/8 pounds.

Table 1-1. Specifications, DQA-10. (Cont'd)

Temperature:	0 to 55°C ambient.
Rack Mounting:	Mounts in half of 19- by 7-inch MR-14 mounting rack adapter. (A companion test message generator may be mounted in other half of rack adapter.)

Table 1-2. Transmission Speeds of Various Clock Source Modules.

CS-4-1:*	45.5, 50.0, 56.9, 66.7, 74.2, 110, 134.49,** 150, and 2400 baud
CS-4-2:	110, 134.49,** 150, 600, 1200, 2400, 4800, 9600, and 50000 baud
CS-4-3:	45.5, 50.0, 75.0, 80.0, 82.5, 96.0, 100, 200, and 300 baud.
Speeds available for special modules	37.5, 45.5, 50.0, 52.5, 55.7, 56.9, 61.1, 66.7, 67.5, 73.3, 74.2, 75.0, 80.0, 82.0, 82.5, 84.9, 91.0, 93.8, 96.0, 100, 110, 112.5, 120, 133.2, 134.49,** 134.5, 135, 140.6, 150, 187.5, 192, 200, 300, 600, 1050, 1200, 1500, 1800, 2,000, 2250, 2400, 3600, 4800, 9600, 18000, 19200, 24000, 28,000, 40800, 48000, and 50000 baud.

*Standard module. Other model variations available on special order.
**Marked on panel 134.5.

SECTION II

INSTALLATION

The Data Quality Analyzers DQA-10 are delivered ready for use. However, it is advisable to perform the following preoperational checks before initial use of the instrument and to perform the indicated procedures if applicable.

2-1. Preoperational Checks. The DQA-10 is set at the factory to operate from a 115-volt 50-60 Hz ac power source. If the instrument is to be used with a 230-volt power source, set the slide switch located on the rear panel below the fuse to expose the number 230.

Check that the rear panel PARITY switch is set on NORM (unless the instrument is to be used to monitor parity at signal speeds greater than 2500 baud).

The DQA-10 is factory-calibrated and should not require any calibration during installation. Calibration check procedure is given in Section V. Check that the rear-panel CAL 0/CAL 49 switch is in the CAL 0 NORM position.

The DQA-10 is shipped from the factory set to receive bipolar (EIA or MIL-188) signals. Check that the rear-panel EIA/MIL INPUT THRESHOLD switch is in the 0 (center) position. If the DQA-10 is to monitor unipolar signals, set the EIA/MIL INPUT THRESHOLD switch to the position indicating the polarity of the unipolar signals (left position for positive signals and right position for negative signals).

The DQA-10 is shipped from the factory set for automatic reset operation of the parity lamps. If it is desired that a single parity event cause the indicating parity lamp to remain lighted until manually reset, follow the procedure of Paragraph 2-3.

2-2. Procedure for Removing the DQA-10 from Case. Do not attempt to remove the DQA-10 from its case unless required by an applicable procedure. Many of the test procedures and adjustments may be performed without removing the instrument from its case.

WARNING

Unless required by a test procedure, do not plug the instrument into the ac power supply while the instrument is out of its case.

a. Remove the four screws located on the rear of the instrument which fasten the top and side cover piece to the chassis.

b. Slide the top and side cover piece back and up to remove it from the instrument.

2-3. Parity Reset Jumper Clip Positioning. Instruments are shipped from the factory with the parity-reset jumper clip in the A position so that the front-panel PARITY lamps follow the signal parity on a character-by-character basis. If manual reset (so that either (or both) lamp(s) indicating one (or more) signal

parity events will light and stay lighted until both lamps are turned off by pressing the RESET pushbutton) is desired, remove the instrument cover (Paragraph 2-2) and set the jumper clip on the SY-1 module to bridge the label M. Refer to the final assembly and module layout drawings in Section VII for the location of the SY-1 module and the jumper clip.

SECTION III

OPERATION

3-1. Panel Functions. Table 3-1 lists the front-panel controls and indicators used in the operation of the DQA-10. Table 3-2 lists the rear-panel controls. Table 3-3 lists the input and output jack functions.

Table 3-1. DQA-10 Front-Panel Controls and Indicators.

Control or Indicator	Position	Function
BAUD mechanically interlocked switch bank	Numeral	When pushed, sets DQA-10 to monitor signals of indicated speed in baud.
	EXT	When pushed, sets DQA-10 to operate from external speed control clock source which must be plugged into CLOCK jack.
LEVEL mechanically interlocked switch bank	–	When pushed, sets DQA-10 to monitor signals of indicated code level.
DSTN mechanically interlocked switch bank	TOTAL	When pushed, sets DQA-10 to measure total distortion of input signal. Measurement is displayed on % DISTORTION scale of meter.
	BIAS	When pushed, sets DQA-10 to measure bias distortion (displacement of space-to-mark transitions). Type of bias is indicated by MARK or SPACE indicator lamp. Measurement is displayed on % DISTORTION scale of meter.
	END	When pushed, sets DQA-10 to measure end distortion (displacement of mark-to-space transitions). Type of end distortion is indicated by MARK or SPACE indicator lamp. Measurement is displayed on % DISTORTION scale of meter.
	SPEED	When pushed, sets DQA-10 to measure speed error of input signal. Type of speed error is indicated by SLOW or FAST indicator lamp. Measurement is displayed on % SPEED ERROR scale of meter.
DSTN independent switch	PEAK	When pushed, sets DQA-10 to display peak distortion readings of selected type distortion.

Table 3-1. DQA-10 Front-Panel Controls and Indicators. (Cont'd)

Control or Indicator	Position	Function
DSTN independent switch (Cont'd)	PEAK	When released, sets DQA-10 to display average distortion of selected type.
INPUT mechanically interlocked switch bank	Numeral (20 or 60)	When pushed, sets DQA-10 to accept neutral signals of indicated loop current at LOOP input jack.
	POLAR	When pushed, sets DQA-10 to accept polar signals (10-100 milliamperes) at LOOP input jack.
	EIA	When pushed, sets DQA-10 to accept EIA signals (negative marking, positive spacing), negative unipolar signals having negative marking, or positive unipolar signals having positive spacing at EIA/MIL input jack. Note that for unipolar signals, the rear-panel EIA/MIL INPUT THRESHOLD switch must be set to the proper polarity.
	MIL	When pushed, sets DQA-10 to accept MIL-188 signals (positive marking, negative spacing), negative unipolar signals having negative spacing, or positive unipolar signals having positive marking at EIA/MIL input jack. Note that for unipolar signals, the rear-panel EIA/MIL INPUT THRESHOLD switch must be set to the proper polarity.
FILT independent switch	Pushed	Connects RC network into LOOP input circuit for filtering relay contact "bounce" of up to 0.5 millisecond in input signal.
	Released	Disconnects filter from LOOP input circuit.
+ TIP independent switch	Pushed	Connects tip of LOOP input jack to positive mark-sensing side of measuring circuitry.
	Released	Connects tip of LOOP input jack to negative mark-sensing side of measuring circuitry.
MARK/SLOW indicator lamp	Lighted	Indicates monitored signal has marking bias, marking end distortion, or slow transmission speed, depending upon DSTN switch selection.
	Unlighted	Applicable condition does not exist.
SPACE/FAST indicator lamp	Lighted	Indicates monitored signal has spacing bias, spacing end distortion, or fast transmission speed, depending upon DSTN switch selection.
	Unlighted	Applicable condition does not exist.

Table 3-1. DQA-10 Front-Panel Controls and Indicators. (Cont'd)

Control or Indicator	Position	Function
PARITY indicator lamps	ODD	If instrument is set for automatic reset, lamp blinks once for each 7- or 8-level character having odd parity. If instrument is set for manual reset, lamp lights when a character having odd parity is received and remains lighted until RESET pushbutton is pushed.
	EVEN	If instrument is set for automatic reset, lamp blinks once for each 7- or 8-level character having even parity. If instrument is set for manual reset, lamp lights when a character having even parity is received and remains lighted until RESET pushbutton is pushed.
Meter	% DISTORTION scale	Registers percent distortion (total, bias, or end) if appropriate DSTN switch is selected and V/MA/DSTN switch is in DSTN position. Reading will be peak distortion if PEAK DSTN switch is selected. Reading will be average distortion if PEAK DSTN switch is not selected.
	EIA/MIL scale	Registers voltage level at EIA/MIL input jack if EIA or MIL INPUT switch is selected and V/MA/DSTN switch is in V/MA position.
	LOOP scale	Registers loop current in milliamperes at LOOP input jack if 60MA, 20MA, or POLAR INPUT switch is selected and V/MA/DSTN switch is in V/MA position.
	% SPEED ERROR scale	Registers percent signal speed error if SPEED DSTN switch is selected and V/MA/DSTN switch is in DSTN position.
V/MA/DSTN toggle switch	V/MA	Sets DQA-10 to measure signal voltage or current depending on INPUT switch selection.
	DSTN	Sets DQA-10 to measure signal distortion of type selected on DSTN switch bank.
SIGS/RESET indicator lamp and momentary pushbutton	Lighted	Indicates signal selected on INPUT switch bank is spacing.
	Unlighted	Indicates selected signal is marking.
	Blinking	Indicates that lamp is following selected signal containing both mark and space bits.

Table 3-1. DQA-10 Front-Panel Controls and Indicators. (Cont'd)

Control or Indicator	Position	Function
SIGS/RESET indicator lamp and momentary pushbutton (Cont'd)	—	When switch is pushed, resets peak distortion measuring circuit. If instrument is set for manual parity reset, also resets PARITY circuits and lamps.
POWER indicator lamp	Lighted	Indicates that internal power supply is on.
	Unlighted	Indicates that internal power supply is off.
OFF toggle switch	Up	Connects internal dc power supply to ac power source.
	Down	Disconnects internal dc power supply from ac power source.

Table 3-2. DQA-10 Rear-Panel Controls and Indicators.

Control or Indicator	Position	Function
CAL 0 potentiometer	—	Used for meter calibration. (See Paragraph 5-3.)
CAL 49 potentiometer	—	Used for meter calibration. (See Paragraph 5-3.)
CAL 0/CAL 49 slide switch	CAL 0 NORM	Sets instrument for normal operation. Also used in instrument calibration (see Paragraph 5-3).
	CAL 49	Used in instrument calibration. (See Paragraph 5-3.)
PARITY slide switch	NORM	Sets instrument for normal operation and measurements at signal speeds up to 2500 baud.
	HI SPEED	Sets instrument to monitor signal parity at speeds greater than 2500 baud.
Voltage input slide switch	115	Sets internal dc power supply to operate from 115-volt ac input.
	230	Sets internal dc power supply to operate from 230-volt ac input.
EIA/MIL INPUT THRESHOLD 3-position slide switch	+	Sets instrument to monitor positive unipolar signals (zero and +1 volt or greater). Front-panel EIA or MIL INPUT switch must be selected for proper marking and spacing voltage state.

Table 3-2. DQA-10 Rear-Panel Controls and Indicators. (Cont'd)

Control or Indicator	Position	Function
EIA/MIL INPUT THRESHOLD 3-position slide switch (Cont'd)	0	Sets instrument to monitor bipolar signals (EIA or MIL-188). Proper front-panel EIA or MIL INPUT switch must be selected.
	–	Sets instrument to monitor negative unipolar signals (zero and more negative than -1 volt) Front-panel EIA or MIL INPUT switch must be selected for proper marking and spacing voltage state.

Table 3-3. DQA Jacks.

Jack	Location	Used for
CLOCK BNC connector	Front Panel	Input from external oscillator for speed control if EXT BAUD switch is selected. If rear-panel PARITY switch is in NORM position, external oscillator must operate at a frequency in Hz of 400 times the signal speed in baud and supply 3-25 volts (peak-to-peak) sinusoidal or square-wave into 600 ohms. If rear-panel PARITY switch is in the HI SPEED position (for signal speed from 2500 to 50,000 baud for parity monitoring only), external oscillator must operate at a frequency in Hz of 4 times the signal speed in baud and supply 3-25 volts (peak-to-peak) sinusoidal or square-wave into 600 ohms.
LOOP 1/4-inch telephone jack	Front Panel	Connection of neutral or high-voltage polar input signals. Loop current should not exceed 200 milliamperes. Mark-sensing polarity of input is controlled by + TIP switch.
EIA/MIL BNC connector	Front Panel	Connection of EIA, MIL-188, or unipolar low-voltage input signals. Proper EIA or MIL INPUT switch must be selected. Rear-panel EIA/MIL INPUT THRESHOLD switch must be set to proper position.
GRD 5-way binding post	Rear Panel	Output connections for instrument signal ground.
ODD 5-way binding post	Rear Panel	Output connection for odd parity indication. Output is normally +2 volts minimum to an external 1,000-ohm load. A ground pulse of 0.5 microsecond minimum duration is provided for each 7- or 8-level character received having odd parity.

Table 3-3. DQA Jacks. (Cont'd)

Jack	Location	Used for
EVEN 5-way binding post	Rear Panel	Output connection for even parity indication. Output is normally +2 volts minimum to an external 1,000-ohm load. A ground pulse of 0.5 microsecond minimum duration is provided for each 7- or 8-level character received having even parity.
CHT 5-way binding post	Rear Panel	Output connection for indication of characters received. Output is normally +2 volts minimum to an external 1,000-ohm load. A ground pulse of 0.5 microsecond minimum duration is provided at the leading edge of the start element of each character received.

3.2. Operating Procedure for Internally Clocked Distortion Measurements. To use the DQA-10 for analyzing telegraph or data signal total, bias, or end distortion, use the following procedure. It should be noted that with the DQA-10, as well as with the Atlantic Research Data Quality Monitors, a single distortion hit of significant magnitude will cause the instrument to respond, even though similar conditions may not have produced indications with other types of measuring and monitoring devices.

a. Plug the ac power cord into an appropriate ac outlet and turn the power switch on. Check that the red POWER indicator lamp is lighted.

b. Check that the rear-panel EIA/MIL INPUT THRESHOLD switch is in the proper position (Table 3-2), that the PARITY switch is in the NORM position, and that the CAL 0/CAL 49 switch is in the CAL 0 NORM position.

c. Select (push) the BAUD, LEVEL, and INPUT switches corresponding to the signal speed, code level, and type of signal to be analyzed.

NOTE

If the desired signal speed is not available on the BAUD switches, use the procedure of Paragraph 3-7 for external speed control.

d. Connect the circuit to be monitored to the appropriate input jack (Table 3-3). Check that the SIGS lamp is blinking to denote that signals are being received.

e. Set the + TIP switch to sense the proper marking polarity (in for positive tip, out for negative tip). If in doubt about input plug polarity, set the input circuit to mark hold and set the + TIP switch so that the SIGS lamp is unlighted.

f. For polar or neutral signals, select (push) the FILT switch if it is desired to filter out relay contact bounce.

NOTE

With the FILT switch selected, the DQA-10 will register erroneously high total or bias distortion if the instrument switching threshold is not properly set (Paragraph 5-4) or if the signal loop current is not within 3 percent of its nominal value. If excessive distortion is registered, release the FILT switch or check the loop current (Paragraph 3-5) and then the potentiometer adjustment (Paragraph 5-4).

g. Select the DSTN switch corresponding to the type of distortion to be measured. Set the V/MA/DSTN switch to the DSTN position.

h. Select the PEAK DSTN switch if it is desired to measure peak distortion (maximum distortion of any single hit). Push the RESET pushbutton momentarily from time to time to prevent the meter from maintaining its highest distortion reading for a period after the distortion level has been reduced. Average distortion measurements of characteristic distortion may be expected to be approximately 1 percent lower than the peak measurements.

i. Read the amount of distortion on the % DISTORTION scale of the meter, with the type of bias or end distortion indicated by either a MARK or SPACE lamp lighted.

j. For 7- or 8-level signals, refer to Paragraph 3-4 for signal parity indications.

3-3. Speed Error Measurement Procedure. To measure speed error of telegraph or data signals, use the following procedure.

a. Make the initial connections in accordance with the procedure of Paragraph 3-2, steps a through f.

b. Select (push) the SPEED DSTN switch. Set the V/MA/DSTN switch to the DSTN position.

c. Read the amount of speed error on the % SPEED ERROR scale of the meter. Note that no calculations are necessary; the percent deviation from nominal speed is indicated directly on the meter. The type of speed error is indicated by either a SLOW or FAST lamp lighted.

3-4. Parity Measurement Procedure. The front-panel PARITY lamps may be set to operate on a character-by-character basis (automatic reset) or to latch, and hold until reset, the indication of single characters having even and/or odd parity (manual reset). Refer to Paragraph 2-3 for instructions for setting the DQA-10 for automatic or manual parity reset. To measure the parity of a 7- or 8-level signal, use the following procedure.

a. Make the initial connections in accordance with the procedure of Paragraph 3-2, steps a through f.

b. For signal speeds below 2500 baud, the DQA-10 provides both distortion measurements (Paragraph 3-2) and parity indications. Check that the rear-panel PARITY switch is in the NORM position. For signal speed from 2500 to 50,000 baud, the DQA-10 provides parity indications only. Check that a DSTN switch is selected and that the rear-panel PARITY switch is in the HI SPEED position.

c. Observe the signal parity indication on the PARITY lamps. If the instrument is set for manual parity reset (Paragraph 2-3) and both lamps are lighted, the signal has contained at least one character of each parity. Push the RESET pushbutton to reset both lamps to off. When the RESET pushbutton is released, the valid signal parity lamp will relight. If the instrument is set for automatic parity monitoring, the appropriate PARITY lamp will blink once for each character received.

d. For external connections to equipment (such as counters for compiling even-parity, odd-parity, and total character counts), use the back-panel 5-way binding posts. The signal supplied is ground-going pulses for each count.

3-5. Loop Current Measurements. To measure neutral or polar loop current accurately, the circuit must be idle. Average loop current measurements may be made on active circuits. To measure loop current, use the following procedure.

a. Make the initial connections in accordance with the procedure of Paragraph 3-2, steps a through e.

b. Set the V/MA/DSTN switch to the V/MA position.

c. Read loop current in milliamperes on the LOOP scale of the meter.

3-6. Signal Voltage Measurement Procedure. To measure EIA or MIL-188 signal voltage, the circuit must be idle (mark-hold or space hold). To measure voltage, use the following procedure.

a. Make the initial connections in accordance with the procedure of Paragraph 3-2, steps a through d.

b. Set the V/MA/DSTN switch to the V/MA position.

c. Read voltage on the EIA/MIL scale of the meter.

3-7. Operating Procedure for Distortion Measurements with External Speed Control. If the desired signal speed is not available on the BAUD switches, a clock source may be provided by a standard laboratory signal generator. The output of the signal generator may be sinusoidal, positive pulses, or square-wave, 3 to 25 volts (peak-to-peak) into 600 ohm load.

a. Select the EXT BAUD switch.

b. Patch the signal generator into the front-panel CLOCK jack.

c. If the monitored signal speed is less than 2500 baud, adjust the signal generator for a frequency (in Hz) 400 times the desired signal speed (in baud). If the monitored signal speed is greater than 2500 baud, adjust the signal generator for a frequency (in Hz) 4 times the desired signal speed in baud.

d. Otherwise follow the procedures of Paragraphs 3-2 through 3-4.

SECTION IV

THEORY OF OPERATION

The Data Quality Analyzer DQA-10 is a self-contained instrument whose internal dc power supply requires only standard (115- or 230-volt) ac input. Digital solid-state logic is used throughout. Because it is recommended that the instrument be returned to the factory for repair or maintenance, the following discussion of the instrument operation will be limited to distortion analysis with internal speed control.

Figure 4-1 is a simplified block diagram of the DQA-10. Complete schematic and layout diagrams of the DQA-10 modules are included in Section VII.

The clock source module (CS-4) generates a highly accurate timing signal at a frequency (in Hz) of 100 times the signal speed (in baud). The clock signal is fed to the distortion counter module (DC-1). The DC-1 generates an "up-down staircase" voltage having 49 steps up and 49 steps down during each signal bit. The DC-1 also receives from the synchronizer module (SY-1) a pulse corresponding to each signal transition which is being monitored (as determined by the selection on the DSTN switch bank). The signal transition pulses are used to trigger a sampling circuit which transmits to the meter drive circuit a voltage from the up-down staircase which reflects the displacement of the monitored signal transition from its ideal zero time reference. The DC-1 also generates a double-speed signal (i.e., frequency in Hz equal to signal speed in baud). This UP signal and an inverted DOWN signal are used for reference timing in the DC-1 and SY-1 modules.

The loop input module (LI-1) contains the isolation and switching threshold control circuits for the neutral or polar input, the bridging and switching threshold control circuits for the low-voltage polar input, the meter drive circuits for voltage and current measurements, and the logic-level buffer-driver for the monitored signal input to the SY-1 module.

The synchronizer module (SY-1) receives the UP signal from the DC-1 module (through the NORM PARITY switch setting). The UP signal is used to step the bit counter. The bit counter output is used to control the speed-error sampling, to generate the system reset signal at the first mark-to-space transition after the bit count corresponding to the end of each signal character (as determined by the selection on the LEVEL switch bank), and to generate a signal to enable the parity counter output at the end of each 7- or 8-level character. The bit counter is reset to zero at the beginning (start element) of each character by the system reset pulse.

The logic-level signal from the LI-1 module is fed to a transition monitor circuit and the selected (on the DSTN switch bank) transitions are transmitted as positive pulses to the DC-1 module and also to the lamp selector and drive circuit to light the MARK/SLOW or SPACE/FAST lamp. The logic-level signal also toggles the parity-counter flip-flop, the output of which is sampled at the end of each 7- or 8-level character. The sampled information is fed to a pair of latching flip-flops which turn on the ODD or EVEN lamp driver. The latching flip-flops may be reset automatically or, if the jumper-clip is in the MANUAL position, by pushing the RESET switch. The logic-level signal is also fed to the SIGS lamp driver. A lighted SIGS lamp corresponds to a spacing bit input.

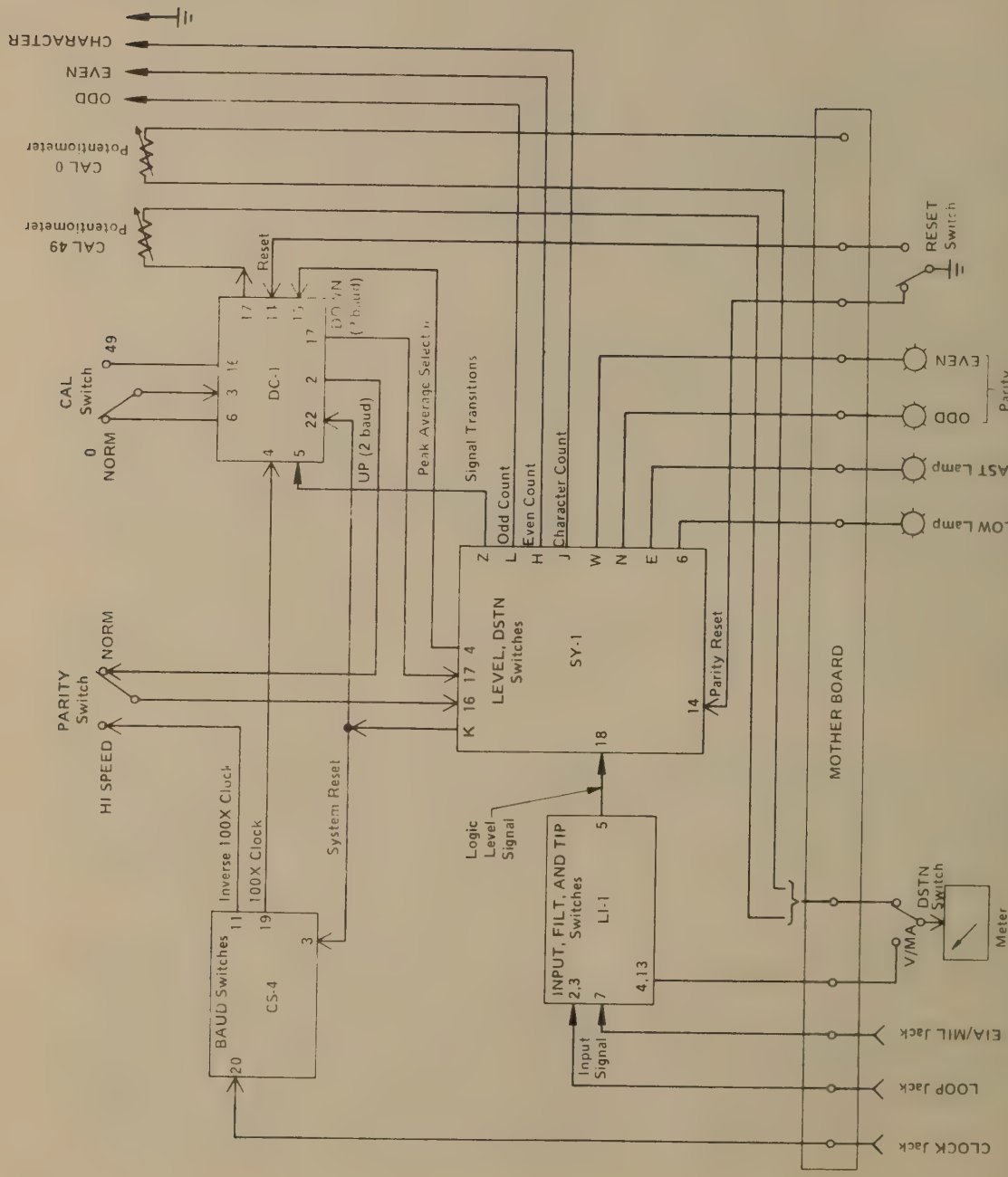


Figure 4-1. Simplified Functional Block Diagram of the DQA-10.

SECTION V

MAINTENANCE

5-1. Maintenance. No routine maintenance is required for the DQA-10. Meter calibration should be performed only when there is reason to believe that % DISTORTION readings are in error more than the 2-percent specified tolerance. Meter calibration procedure is given in Paragraph 5-3. If, with the meter in proper calibration, neutral signals of precisely-known distortion fail to produce meter readings within 2 percent of the known distortion, check the threshold potentiometer setting in accordance with Paragraph 5-4. Should the EIA/MIL signal voltage fail to read zero with the DQA-10 set for voltage measurement (Paragraph 3-5) but no EIA/MIL input connection, follow the procedure of Paragraph 5-5. To remove the DQA-10 from its case, use the procedure of Paragraph 2-2. To remove a printed-circuit module from the DQA-10, follow the procedure of Paragraph 5-6.

5-2. Fuse and Lamp Replacement. The fuse is located on the rear panel. For 115-volt operation use 1/4-ampere slow-blow replacement fuse; for 230-volt operation use 1/8-ampere slow-blow replacement fuse. The two indicator lamps are located on the front panel. Replacement lamps should be General Electric No. 387, or equivalent.

5-3. Meter Calibration Procedure. To check the meter calibration, use the following procedure.

a. Check that the meter reads zero. If necessary, adjust the mechanical zero. The adjustment screw is reached by removing the gray front-panel overlay (Paragraph 5-6, steps b and c).

b. Plug the ac power cord into an appropriate ac outlet and turn the power switch on. Check that the red POWER indicator lamp is lighted.

c. Disconnect any inputs from the LOOP and EIA/MIL jacks, or disengage all INPUT switches.

d. Select (push) a BAUD, LEVEL, and the PEAK DSTN switch. Set the V/MA/DSTN switch to the DSTN position. Setting of the other front-panel switches is immaterial.

e. Check that the rear-panel CAL 0/CAL 49 switch is in the CAL 0-NORM position and that the PARITY switch is in the NORM position. Position of the EIA/MIL INPUT THRESHOLD switch is immaterial.

f. Check that the meter reads 0 percent. Adjust the rear-panel CAL 0 potentiometer if necessary. Note: If the meter pegs to the left of zero, a BAUD or a LEVEL switch selection has not been made.

g. Set the rear-panel CAL 0/CAL 49 switch to CAL 49.

h. Check that the meter reads 49 percent. Adjust the rear-panel CAL 49 potentiometer if necessary.

i. Repeat steps e through h until both meter readings are accurate.

5-4 Procedure for Setting Threshold Potentiometers for Neutral Signal Input. If there is reason to believe that the DQA-10 distortion measurements of neutral signals is consistently excessive, or if it is desired to set the DQA-10 to monitor neutral signals of a different loop-current value, use the following procedure.

a. Set the monitored circuit to mark-hold and measure the loop current (Paragraph 3-4). If the measured loop current is not within 10 percent of its nominal value, steps should be taken to correct the loop current. Do not make adjustments on the DQA-10 until an operational loop-current value has been established and measured.

b. Adjust the loop current input (using the actual loop, if possible) down from its nominal value until the SIGS lamp lights. Read the value of loop current input. If the measured input is half ±2 milliamperes, no potentiometer adjustment is necessary. Note that for low input currents it may be necessary to use an external milliammeter to measure input current.

c. If the measured input of step b is not within the limits, remove the DQA-10 from its case (Paragraph 2-2).

WARNING

High voltages exist in the dc power supply located on the mother board module at the bottom of the instrument. Do not attempt to reach components near the mother board module.

d. Using an external milliammeter, adjust the loop input current to precisely 50 percent of its nominal value.

e. Refer to the final assembly, schematic, and layout diagrams in Section VII of this manual for location of the LI-1 module and the proper threshold potentiometer. (R13 is associated with the upper neutral INPUT switch; R14 is associated with the lower neutral INPUT switch.) Adjust the threshold potentiometer counterclockwise until the SIGS lamp goes off.

f. Back up (clockwise) on the potentiometer adjustment slowly until the SIGS lamp lights.

g. Replace the instrument cover, readjust the loop current to its normal value, and relabel the INPUT switch if the nominal loop current has been changed.

5-5. Procedure for Setting ZERO-CENTER Potentiometer for EIA/MIL Input Voltage Measurement. To adjust the EIA/MIL voltage scale to zero, use the following procedure.

a. Remove the DQA-10 from its case (Paragraph 2-2).

b. Plug the ac power cord into an appropriate ac outlet and turn the power switch on.

WARNING

High voltages exist in the dc power supply located on the mother board module at the bottom of the instrument. Do not attempt to reach components near the mother board module.

c. Connect the EIA/MIL input to ground. Select the EIA or MIL INPUT switch and set the V/MA/DSTN switch to V/MA.

d. Refer to the final assembly, schematic, and layout diagrams in Section VII of this manual for the locations of the LI-1 module and ZERO-CENTER potentiometer R1. Adjust R1 until the meter reads zero volts on the EIA/MIL scale.

e. Replace the instrument cover.

5-6. Procedure for Removing Printed-Circuit Module. Should it be necessary to remove a printed-circuit module from the DQA-10, use the following procedure.

a. Remove the DQA-10 from its case (Paragraph 2-2). Be sure that the ac power cord is disconnected from the power source.

b. Remove the exposed screws from the front panel.

c. Remove the gray front-panel overlay.

d. Remove the two screws located on the front panel at the top and bottom of the printed-circuit module which is to be removed. Refer to the final assembly diagram in Section VII for the locations of the printed-circuit modules.

e. Rock the printed-circuit module out of its connector and lift up and back to get it out of the case. Note that the front-panel switches are part of the printed-circuit module.

5-7. CS-4 Speed Substitution and Crystal Replacement. Instruments are shipped from the factory ready for operation at any of the speeds indicated on the front-panel switches.

To substitute a crystal in the CS-4 module to provide a new transmission speed capability, first determine the crystal required for the desired speed. For guaranteed operation and speed accuracy, order the crystal from Atlantic Research Corporation.

Crystal Selection. If the desired speed is one of the standard speeds listed in Table 5-1, read the crystal frequency required and strap required from the chart. If the desired speed is not one of the standard speeds, calculate the required crystal frequency, using the following procedure.

a. From Table 5-2, read the "multiplier" which applies to the speed range within which the desired speed lies. (Where two speed ranges overlap, there will be two acceptable crystal frequencies with different installation strapping requirements.)

b. Multiply the desired speed (in baud) by the "multiplier" from step a to obtain crystal frequency in Hz.

c. Note the strap requirement, for use during the installation procedure.

Table 5-1. CS-4 Crystal Frequencies and Strapping for Standard Signal Speeds.

Speed (baud)	Crystal Frequency Required (Hz)	Strap Required
37.5	240,000	64
44.5	284,950	64
45.5483 (45.5)	291,509	64
50.0	320,000	64
52.5	336,000	64
55.7	356,480	64
56.8546 (56.9)	363,869	64
61.1	391,040	64
66.7	426,666	64
67.5	432,000	64
73.3	469,120	64
74.268 (74.2)	475,052	64
75.0	480,000	64
80.0	256,000	32
82.0	262,400	32
82.5	264,000	32
84.9	271,680	32
91.0	291,200	32
93.8	300,160	32
96.0	307,200	32
100.0	320,000	32
110.0	352,000	32
112.5	360,000	32
120.0	384,000	32
133.2	426,240	32
134.49	430,368	32
134.5	430,400	32
135.0	432,000	32

Table 5-1. CS-4 Crystal Frequencies and Strapping for Standard Signal Speeds. (Cont'd)

Speed (baud)	Crystal Frequency Required (Hz)	Strap Required
140.6	449,920	32
150.0	480,000	32
187.5	300,000	16
192.0	307,200	16
200.0	320,000	16
300.0	480,000	16
600.0	480,000	8
1,050.0	420,000	4
1,200.0	480,000	4
2,000.0	800,000	4
2,250.0	900,000	4
2,400.0	960,000	4

Table 5-2. Crystal Selection Chart.

Speed Range (baud)	Multiply Speed by	Use Strap
For Distortion and Parity Measurements		
30-78	6,400	64
60-156	3,200	32
120-312	1,600	16
240-625	800	8
480-2,500	400	4
For High-Speed Parity Measurements		
2,500-7,500	64	64
7,000-15,000	32	32

Table 5-2. Crystal Selection Chart. (Cont'd)

Speed Range (baud)	Multiply Speed by	Use Strap
For High-Speed Parity Measurements (Cont'd)		
14,000-30,000	16	16
28,000-60,000	8	8

For example: The crystal selected for a transmission speed of 2,000 baud should be 800,000 Hz (2,000 x 400) with strap 4 required.

Crystal Installation. Install the new crystal in the DQA-10, using the following procedure.

a. Consult the CS-4 schematic and layout diagrams (in Section VII of this manual) and decide which BAUD switch is to be used for the new speed.

b. Remove the DQA-10 from its case (Paragraph 2-2, steps a and b). If strap changes are required remove the CS-4 module from the instrument (Paragraph 5-6).

c. Install the new crystal in the proper position. Note crystal position 1 corresponds to the top BAUD switch and strapping terminal A.

d. Check the strapping between the lettered terminal corresponding to the switch position and the numbered terminal. If the strapping is not that which was determined in step c of the crystal selection procedure, remove the existing strap and install the proper new wire strap. Record the new strapping on the CS-4 schematic diagram in Section VII. Check that none of the existing wire straps are disconnected by the new installation. Reconnect disconnected straps if necessary.

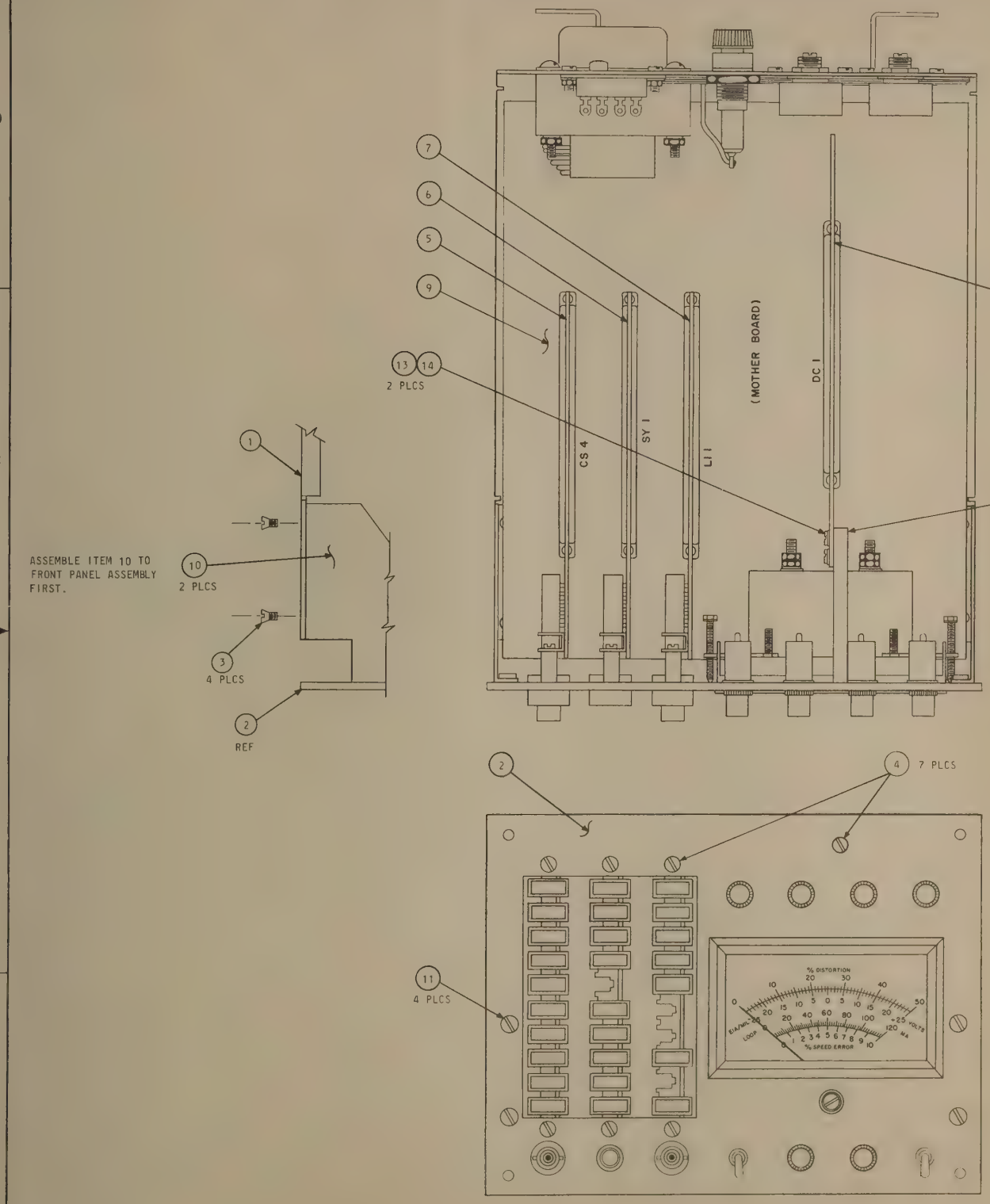
e. Remount the CS-4 module and return the DQA-10 to its case.

f. Record the new speed in the proper switch position on the DQA-10 front panel.

5-8. Repair. Only factory repair is recommended for the DQA-10.

SECTION VII

DRAWINGS


4
3
D
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13
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2 PLCS
CS 4
SY I
LI I
(MOTHER BOARD)
DC I
1
ASSEMBLE ITEM 10 TO FRONT PANEL ASSEMBLY FIRST.
10
2 PLCS
3
4 PLCS
2
REF
2
4
7 PLCS
11
4 PLCS
% DISTORTION
% SPEED ERROR
VOLTS
MA
4
3

2 1

REVISIONS					
SYM	DESCRIPTION	DATE	BY	CHK	APPD

D

C

B

A

QTY REQD	PART OR IDENTIFYING NO.	ITEM NO.	DESCRIPTION	REF DESIG	MANUFACTURER
1	PL-705	22	COVER ASSEMBLY		ARC
1	33486	21	LABELS, SWITCH, TP-31378676-3		
1	34475	20	CABINET, OPTIMA, TP-41830676		SCIENTIFIC ATLANTA
1	33488	19	FRONT PANEL OVERLAY, TP-41867690		DURALITH
4	33697	18	SCREW, DECORATIVE, #6-32NC-2 X 1/2 LG, SS, PH HD.		STAKE FASTENER CO.
6	———	17	WASHER, LOCK, SPLIT, #6, SS		
2	33717	16	NUT, CAP, HEX, ACORN, N/P BRASS, #6-32NC-2		
4	———	15	SCREW, PH, #6-32NC-2 X 3/16 LG., SS		
2	———	14	WASHER, LOCK, INTERNAL TOOTH, #4, SS		
2	———	13	SCREW, PAN HD, #4-40NC-2 X 1/4 LG., SS		
1	TP-21789690	12	CARD SUPPORT		ARC
4	———	11	SCREW, FLAT HD, #6-32NC-2 X 3/8 LG, SS		
2	TP-DA-21778676	10	GUSSET		ARC
1	TP-AD-41876690	9	P.C. BOARD ASSEMBLY, PS-MB		ARC
1	TP-AD-41885690	8	P.C. BOARD ASSEMBLY, DC-1		ARC
1	TP-AD-41879690	7	P.C. BOARD ASSEMBLY, L1-1		ARC
1	TP-AD-41882690	6	P.C. BOARD ASSEMBLY, SY-1		ARC
1	TP-AD 41899688	5	P.C. BOARD ASSEMBLY, CS-4		ARC
7	———	4	SCREW, FLAT HD, #4-40NC-2 X 1/4 LG., SS		
4	———	3	SCREW, FLAT HD, #6-32NC-2 X 3/16 LG, SS		
1	TP-AD-41873690	2	FRONT PANEL ASSEMBLY		ARC
1	TP-SA-41874690	1	CHASSIS ASSEMBLY		ARC

LIST OF MATERIALS OR PARTS LIST

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES:
ANGLES ± ———
FRACTIONS ± ———
2 PLACE DECIMALS ± ———
3 PLACE DECIMALS ± ———
SURFACE ROUGHNESS √

DO NOT SCALE DRAWING

MATERIAL: ———

APPROVAL	BY	DATE
DRAWN	E Ueiwon	1/12/67
CHECKED		
ENGRG		
PROJ ENGRG		
STRESS		

APPROVED FOR ATLANTIC RESEARCH
NAME DATE 19

APPROVED
NAME DATE 19

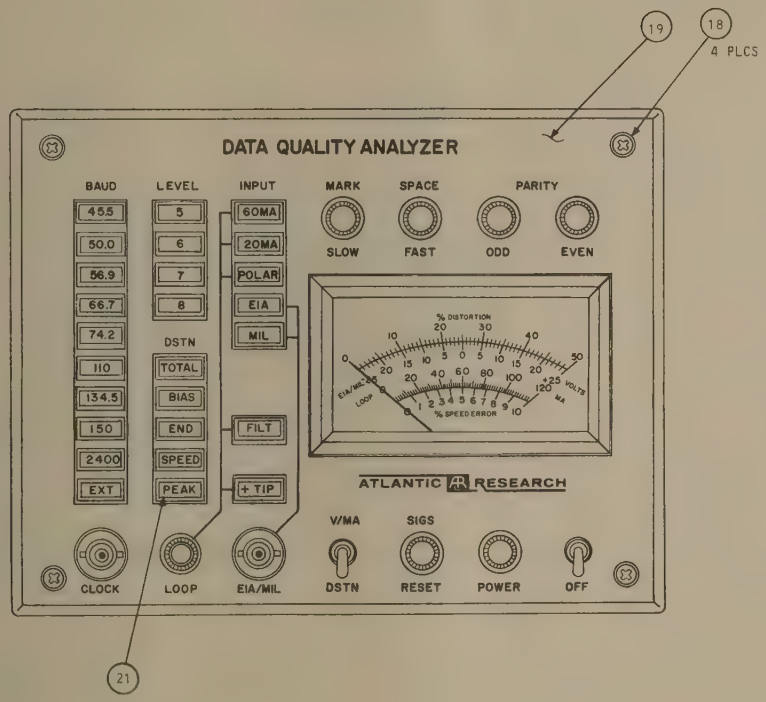
ATLANTIC RESEARCH CORPORATION
TELEPRODUCTS DEPT
A DIVISION OF THE SUSQUEHANNA CORP
ALEXANDRIA, VIRGINIA – 22314

FINAL ASSEMBLY DQA-10

CODE IDENT NO.	SIZE		REV
95335	D	TP-FA-41872690	— LTR
SCALE: 1/1			SHEET 1 OF 2

DASH NO	NEXT ASSEMBLY	PROJECT
APPLICATION		

2 1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18
4 PLCS
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BAUD
LEVEL
INPUT
MARK
SPACE
PARITY
45.5
50.0
56.9
66.7
74.2
110
134.5
150
2400
EXT
5
6
7
8
60MA
20MA
POLAR
EIA
MIL
SLOW
FAST
ODD
EVEN
DSTN
TOTAL
BIAS
END
SPEED
PEAK
FILT
+ TIP
% DISTORTION
% SPEED ERROR
EIA/MIL
LOOP
VOLTS
MA
ATLANTIC AR RESEARCH
V/MA
SIGS
CLOCK
LOOP
EIA/MIL
DSTN
RESET
POWER
OFF
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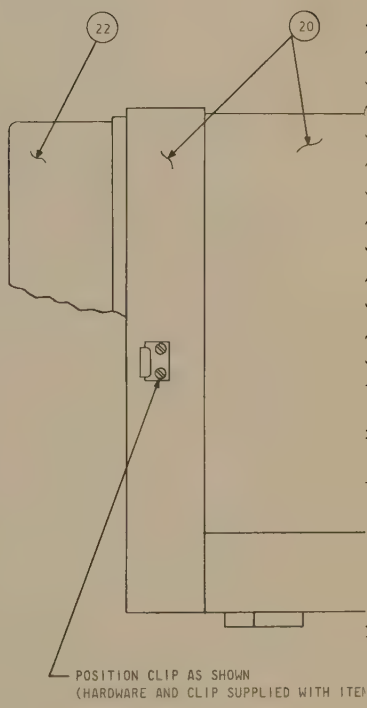
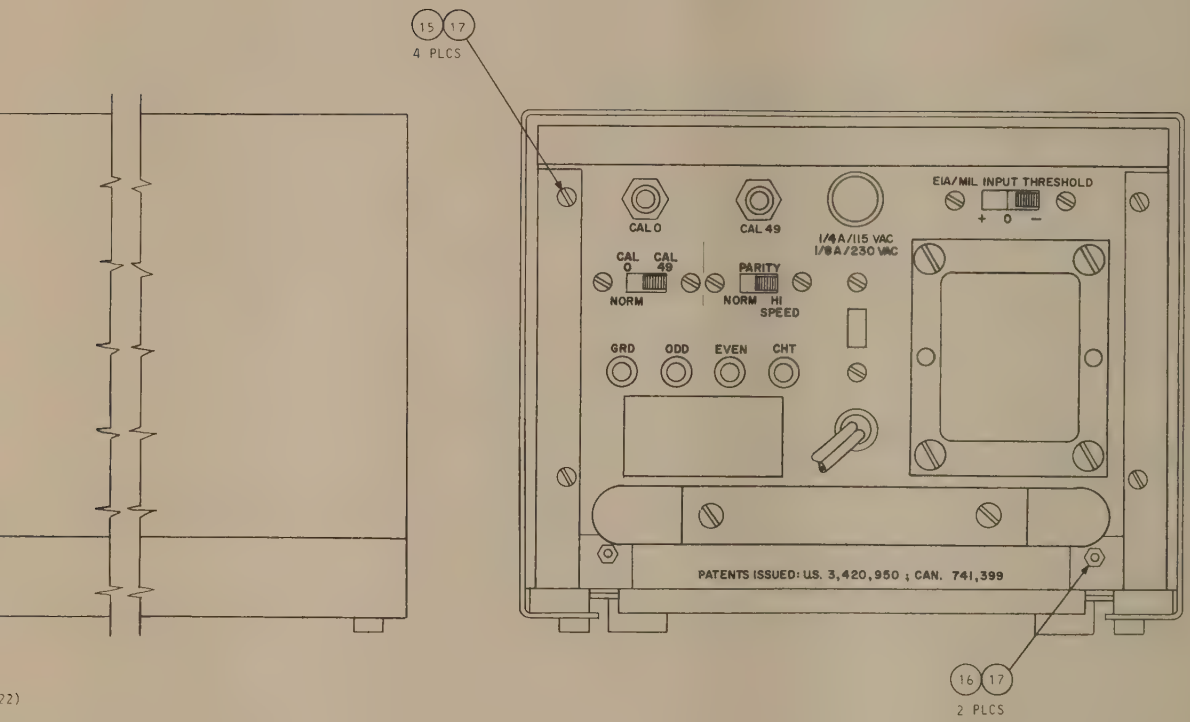

22
20
POSITION CLIP AS SHOWN
(HARDWARE AND CLIP SUPPLIED WITH ITEM

REVISIONS					
SYM	DESCRIPTION	DATE	BY	CHK	APPD



QTY REQD	PART OR IDENTIFYING NO.	ITEM NO.	DESCRIPTION	REF DESIG	MANUFACTURER

LIST OF MATERIALS OR PARTS LIST

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES.
TOLERANCES:
ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
SURFACE ROUGHNESS √
DO NOT SCALE DRAWING
MATERIAL:

APPROVAL	BY	DATE
DRAWN	E Vinson	1/20/70
CHECKED	[illegible]	6 3 71
ENGRG	[illegible]	6 4 71
PROJ ENGRG	[illegible]	[illegible]
STRESS		

APPROVED FOR ATLANTIC RESEARCH
NAME DATE 19
APPROVED
NAME DATE 19

ATLANTIC RESEARCH CORPORATION
TELEPRODUCTS DEPT
A DIVISION OF THE SUSQUEHANNA CORP
ALEXANDRIA VIRGINIA 22314

FINAL ASSEMBLY
DQA-10

CODE IDENT NO.	SIZE		REV
95335	D	TP-FA-41872690	— LTR
SCALE 1/1		SHEET 2OF2	

DASH NO.	NEXT ASSEMBLY	PROJECT
APPLICATION		

4 3

D

C

B

A

CRYSTAL SELECTION CHARTS

TMG-10/DQA-10

BAUD RANGE	MULTIPLIER	STRAP
30 - 78	6,400	64
60 - 156	3,200	32
120 - 312	1,600	16
240 - 625	800	8
480 - 2.5K	400	4

TMG-10 ONLY

BAUD RANGE	MULTIPLIER	STRAP
960 - 5K	200	2
1.92K - 10K	100	1
10K - 50K	20	1

*SEE NOTE 2

DQA-10 PARITY ONLY

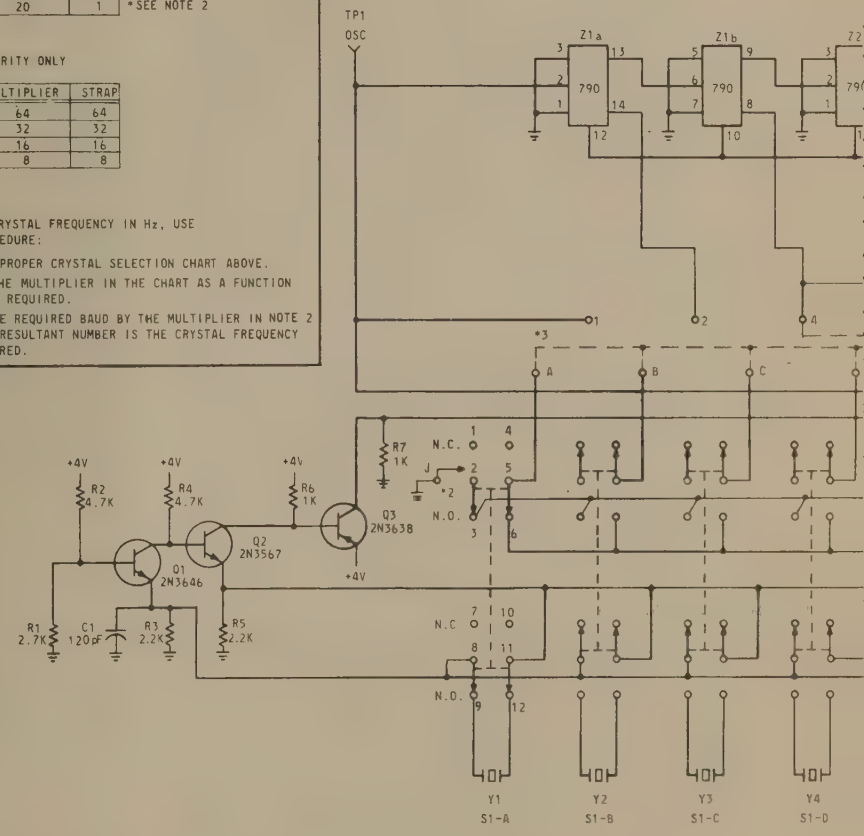
BAUD RANGE	MULTIPLIER	STRAP
2.5K - 7.5K	64	64
7K - 15K	32	32
14K - 30K	16	16
28K - 60K	8	8

TO DETERMINE THE CRYSTAL FREQUENCY IN Hz, USE THE FOLLOWING PROCEDURE:

1. SELECT THE PROPER CRYSTAL SELECTION CHART ABOVE.
2. DETERMINE THE MULTIPLIER IN THE CHART AS A FUNCTION OF THE BAUD REQUIRED.
3. MULTIPLY THE REQUIRED BAUD BY THE MULTIPLIER IN NOTE 2 ABOVE. THE RESULTANT NUMBER IS THE CRYSTAL FREQUENCY IN Hz REQUIRED.

	CS-4-1 TMG-10/DQA-10			CS-4-2 TMG-10	
CRYSTAL	FREQ. IN KHz	STRAP	BAUD	FREQ. IN KHz.	S
Y1	291.509	A-64	45.5	352.000	
Y2	320.000	B-64	50.0	430.368	
Y3	363.869	C-64	56.9	480.000	
Y4	426.666	D-64	66.7	480.000	
Y5	475.052	E-64	74.2	240.000	
Y6	352.000	F-32	110	240.000	
Y7	430.368	G-32	134.49	480.000	
Y8	480.000	H-32	150	960.000	
Y9	960.000	I-4	2400	1,000.000	*

* TERMINAL J CONN
S1-I, PIN 2. SE



NOTES:

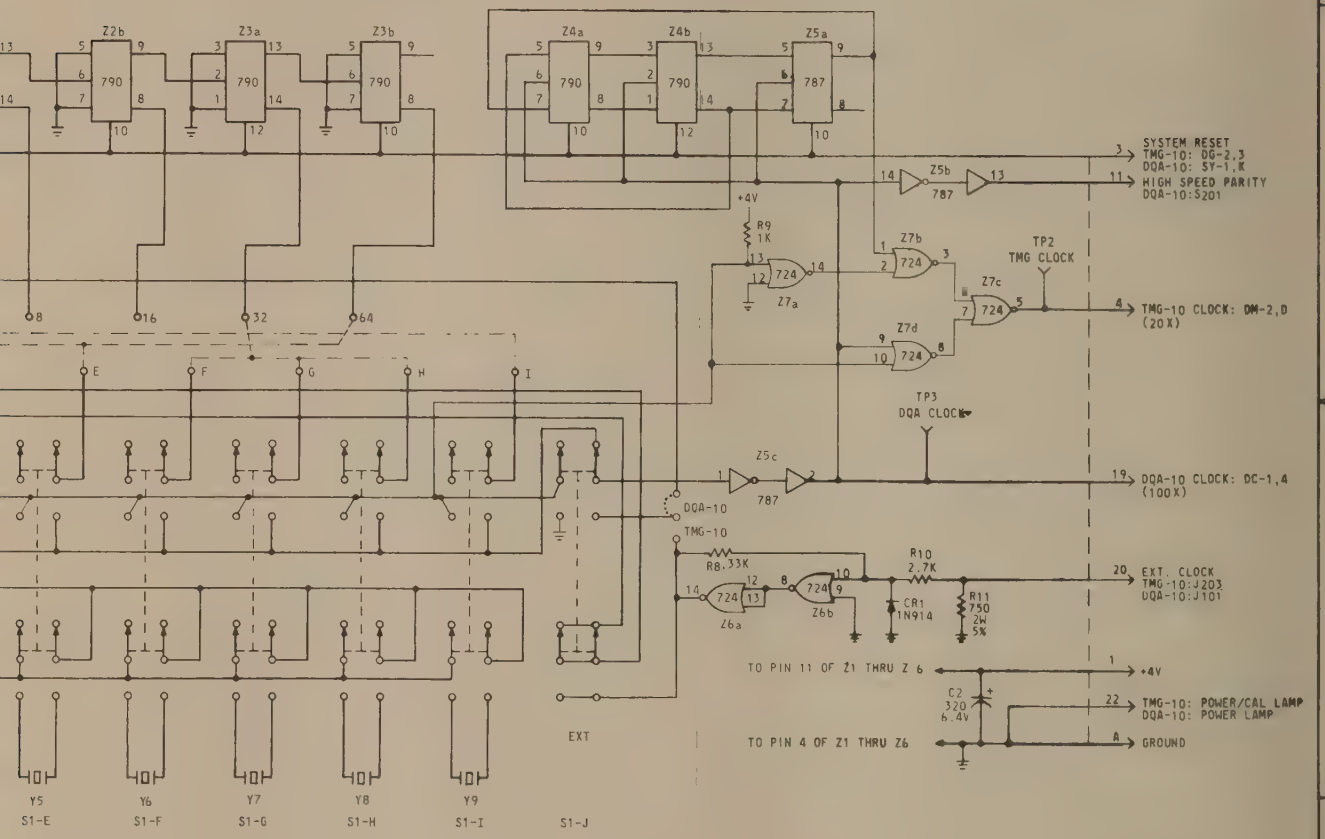
1. UNLESS OTHERWISE SPECIFIED:
   A. ALL CAPACITANCE VALUES ARE IN MICROFARADS.
   B. ALL RESISTANCE VALUES ARE IN OHMS, 1/4W, ±10%.
2. TERMINAL "J" IS USED WITH SPEEDS ABOVE 10,000 BAUD IN THE TMG-10 ONLY.
3. STRAPPING SHOWN CORRESPONDS TO CS-4-1.
4. S1 IS MECHANICALLY INTERLOCKED SWITCH WITH S1-A SHOWN IN THE ENERGIZED POSITION, (PUSHED-IN).
5. CRYSTALS SHALL BE TESTED IN ACCORDANCE WITH ATLANTIC RESEARCH CORP. DRAWING NO. TP-21801000.

4 3

ONLY		CS-4-3 TMG-10/DQA-10		
AP	BAUD	FREQ. IN KHz.	STRAP	BAUD
32	110	291.509	A-64	45.5
32	134.49	320.000	B-64	50.0
32	150	480.000	C-64	75.0
8	600	256.000	D-32	80.0
2	1200	264.000	E-32	82.5
1	2400	307.200	F-32	96.0
1	4800	320.000	G-32	100
1	9600	320.000	H-16	200
1	50,000	480.000	I-16	300

CTED TO
NOTE 2.

REVISIONS					
SYM	DESCRIPTION	DATE	BY	CHK	APPD
A	CHANGED S1J SECTION B2. EN 1007	5-20-70	PS		
B	Q2 WAS 2N3646; CS-4-2, Y4 WAS 240. EN 1105A	7-20-70	EV		
C	ADDED NOTES 4 & 5. EN 1171	9-2-70	EV		



QTY REQD	PART OR IDENTIFYING NO.	ITEM NO.	DESCRIPTION	REF DESIG	MANUFACTURER
-			LIST OF MATERIALS OR PARTS LIST		

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES.
TOLERANCES:
ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
SURFACE ROUGHNESS

DO NOT SCALE DRAWING

MATERIAL:

APPROVAL	BY	DATE
DRAWN	E Wilson	7/26/69
CHECKED	S. Ash	2/16/70
ENGRG	[illegible]	2/16/70
PROJ ENGRG	[illegible]	2-16-70
STRESS		

APPROVED FOR ATLANTIC RESEARCH NAME DATE 19
APPROVED NAME DATE 19

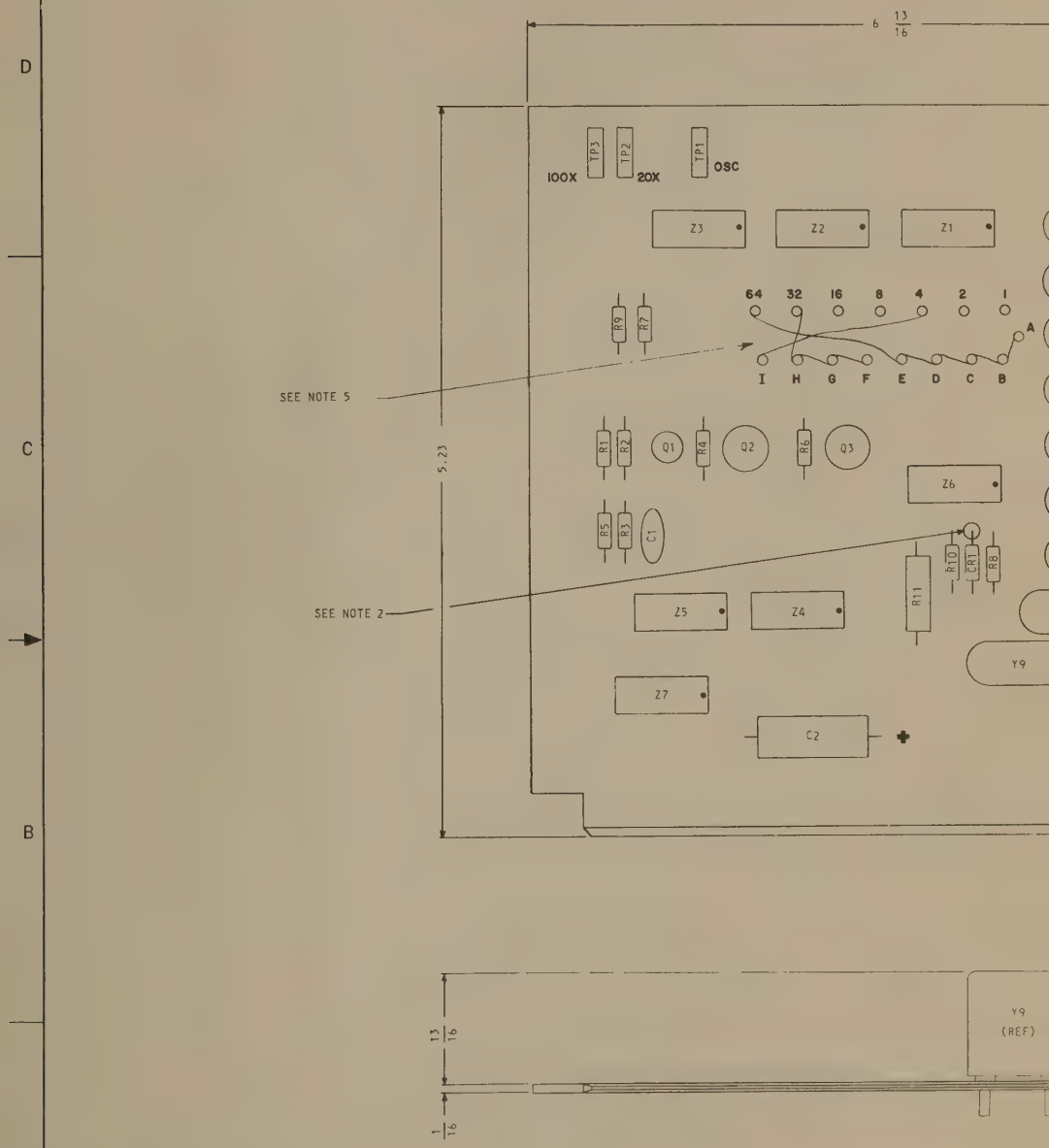
ATLANTIC RESEARCH CORPORATION
TELEPRODUCTS DIVISION
ALEXANDRIA, VIRGINIA

SCHEMATIC DIAGRAM CLOCK SOURCE CS-4

SERIES "A"

CODE IDENT NO.	SIZE		REV
95335	D	TP-SD-41898688	C LTR
SCALE NONE		SHEET 1 OF 1	

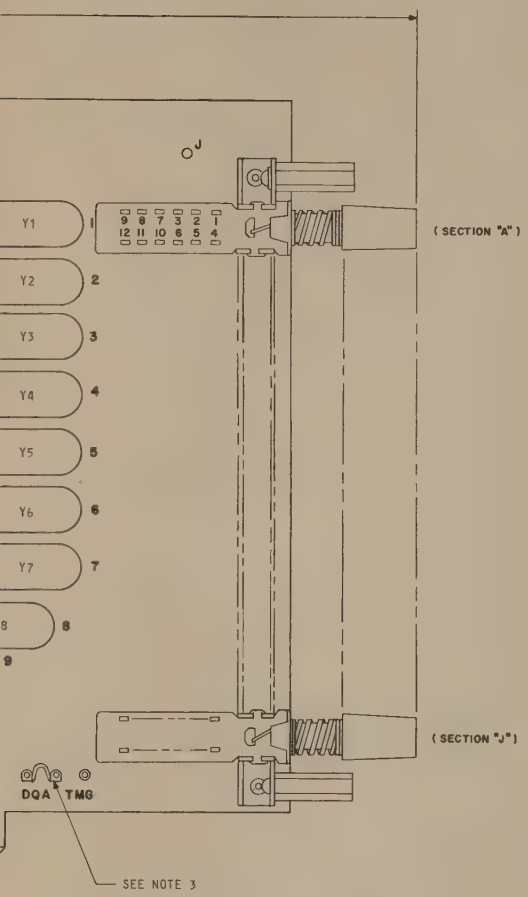
—	TP-AD-41899688	688
DASH NO.	NEXT ASSEMBLY	PROJECT
APPLICATION		

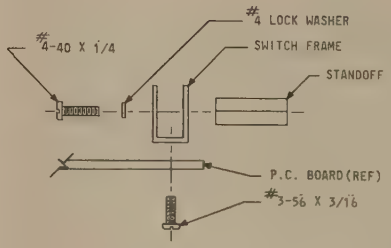


NOTES:

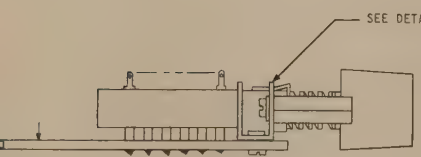
1. ALL DIMENSIONS ARE REFERENCE.
2. CIRCLE INDICATES CATHODE END OF DIODE.
3. STRAP POSITION SHOWN IS FOR REFERENCE ONLY.
4. INSTALL SWITCH LABELS ACCORDING TO SPEED CHART ON SCHEMATIC DIAGRAM, TP-SD-41898688.
5. STRAPPING SHOWN IS FOR CS-4-1.
6. INSTALL SWITCHES AFTER WAVESOLDER CLEANING OPERATION.

REVISIONS					
SYM	DESCRIPTION	DATE	BY	CHK	APPD
A	ADDED NOTE 4 & 5 & STRAPPING. EN 1007	5-20-70	PES	[illegible]	[illegible]
B	CASE SIZE OF Q2 WAS TO18. EN 1105	7-20-70	EV	[illegible]	[illegible]
C	ADDED NOTE 6. EN 1374	10/14/71	[illegible]	[illegible]	[illegible]





DETAIL "A"



3/16

QTY REQD	PART OR IDENTIFYING NO.	ITEM NO.	DESCRIPTION	REF DESIG	MANUFACTURER

LIST OF MATERIALS OR PARTS LIST

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES.
TOLERANCES:
ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
SURFACE ROUGHNESS √

DO NOT SCALE DRAWING

MATERIAL:

APPROVAL	BY	DATE
DRAWN	E Vinson	1/29/70
CHECKED	S IUKS	2/16/70
ENGRG	D Hardy	2/16/70
PROJ ENGRG	[illegible]	6/10
STRESS		

APPROVED FOR ATLANTIC RESEARCH _____ 19__ (NAME) (DATE)
APPROVED _____ 19__ (NAME) (DATE)

ATLANTIC RESEARCH CORPORATION
TELEPRODUCTS DEPT
A DIVISION OF THE SUSQUEHANNA CORP
ALEXANDRIA, VIRGINIA – 22314

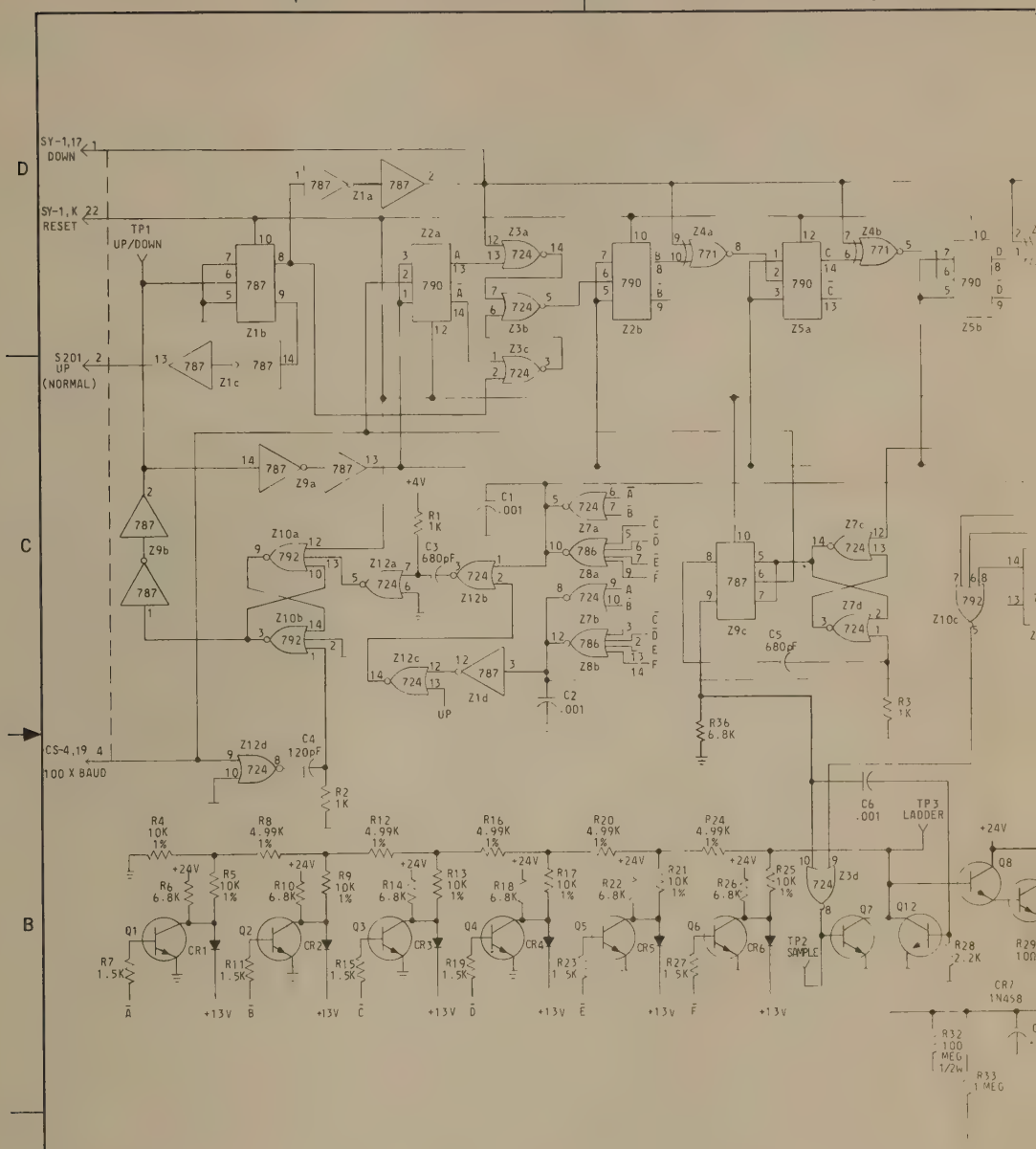
PRINTED CIRCUIT BOARD ASS'Y
CLOCK SOURCE
CS-4

CODE IDENT NO.	SIZE		REV
95335	D	TP-AD-41899688	C LTR

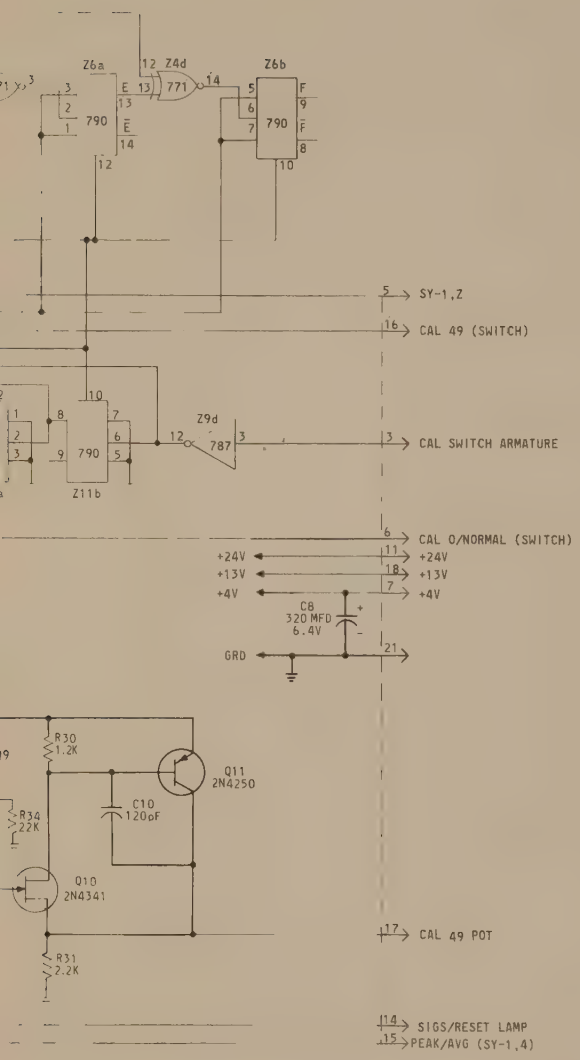
SCALE: 2/1 SHEET 1 OF 1

ALL	TP-FA-41834676	TMG-10
ALL	TP-FA-41872690	DQA-10
DASH NO.	NEXT ASSEMBLY	PROJECT

APPLICATION


SY-1,17 DOWN
SY-1,K 22 RESET
TP1 UP/DOWN
S201 UP (NORMAL)
CS-4,19 4 100 X BAUD
+4V
+24V
+13V
UP
TP2 SAMPLE
TP3 LADDER
NOTES:
1. UNLESS OTHERWISE SPECIFIED:
A. ALL CAPACITANCE VALUES ARE IN MICROFARADS.
B. ALL RESISTANCE VALUES ARE IN OHMS, 1/4W, ±10%.
C. ALL DIODES ARE 1N914.
D. ALL TRANSISTORS ARE MPS6530.

REVISIONS					
SYM	DESCRIPTION	DATE	BY	CHK	APPD
A	Q10 WAS 2N5458; DELETED R35 & C9. EN 1104	7/20/70	EV		AQ
B	ADDED R36 AND C10. EN'S 1269, 1273	10-12-71	EV		



QTY REQD	PART OR IDENTIFYING NO.	ITEM NO.	DESCRIPTION	REF DESIG	MANUFACTURER
			LIST OF MATERIALS OR PARTS LIST		

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES.
TOLERANCES:
ANGLES ± ——
FRACTIONS ± ——
2 PLACE DECIMALS ± ——
3 PLACE DECIMALS ± ——
SURFACE ROUGHNESS

DO NOT SCALE DRAWING

MATERIAL:

APPROVAL	BY	DATE
DRAWN		10/17/69
CHECKED		6-3-70
ENGRG		6-4-70
PROJ ENGRG		6-5-70
STRESS		

APPROVED FOR ATLANTIC RESEARCH _____ 19__ (NAME / DATE)
APPROVED _____ 19__ (NAME / DATE)

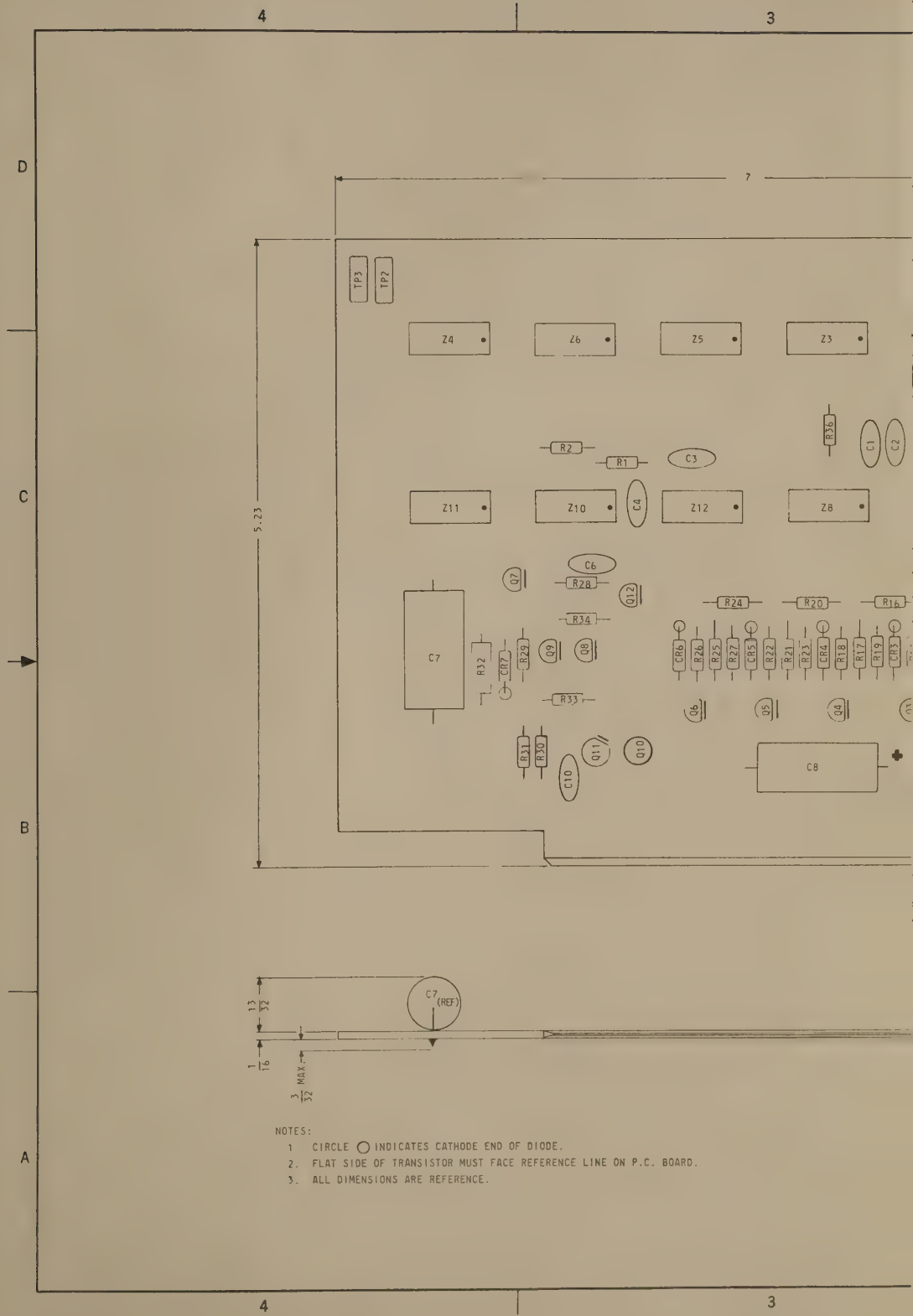
ATLANTIC RESEARCH CORPORATION
TELEPRODUCTS DIVISION
ALEXANDRIA, VIRGINIA

SCHEMATIC DIAGRAM
DC-I
DQA-10

CODE IDENT NO.	SIZE		REV
95335	D	TP-SD-41884690	B LTR

SCALE: —— SHEET 1 OF 1

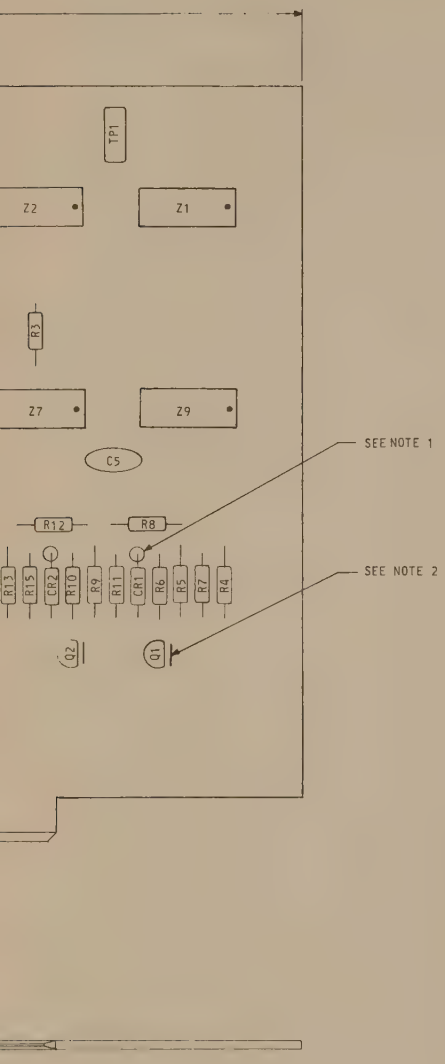
-	TP-AD-41885690	690
DASH NO.	NEXT ASSEMBLY	PROJECT
APPLICATION		



NOTES:

1. CIRCLE ◯ INDICATES CATHODE END OF DIODE.
2. FLAT SIDE OF TRANSISTOR MUST FACE REFERENCE LINE ON P.C. BOARD.
3. ALL DIMENSIONS ARE REFERENCE.

REVISIONS					
SYM	DESCRIPTION	DATE	BY	CHK	APPD
A	DELETED C9 & R35; Q10 CASE WAS TO92. EN 1104	7-20-70	EV		
B	ADDED R36, CHANGED POSITIVE SIGN C8 TO OTHER END, ADDED C10. EN'S 1269,1240,1273.	10-12-71	EV		



QTY REQD	PART OR IDENTIFYING NO.	ITEM NO.	DESCRIPTION	REF DESIG	MANUFACTURER

LIST OF MATERIALS OR PARTS LIST

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES.
TOLERANCES:
ANGLES ± ——
FRACTIONS ± ——
2 PLACE DECIMALS ± ——
3 PLACE DECIMALS ± ——
SURFACE ROUGHNESS √
DO NOT SCALE DRAWING
MATERIAL: ——

APPROVAL	BY	DATE
DRAWN	[illegible]	12-25-70
CHECKED	[illegible]	6-3-75
ENGRG	[illegible]	6 4 70
PROJ ENGRG	[illegible]	6 5 70
STRESS		

APPROVED FOR ATLANTIC RESEARCH ____ NAME ____ DATE 19__
APPROVED ____ NAME ____ DATE 19__

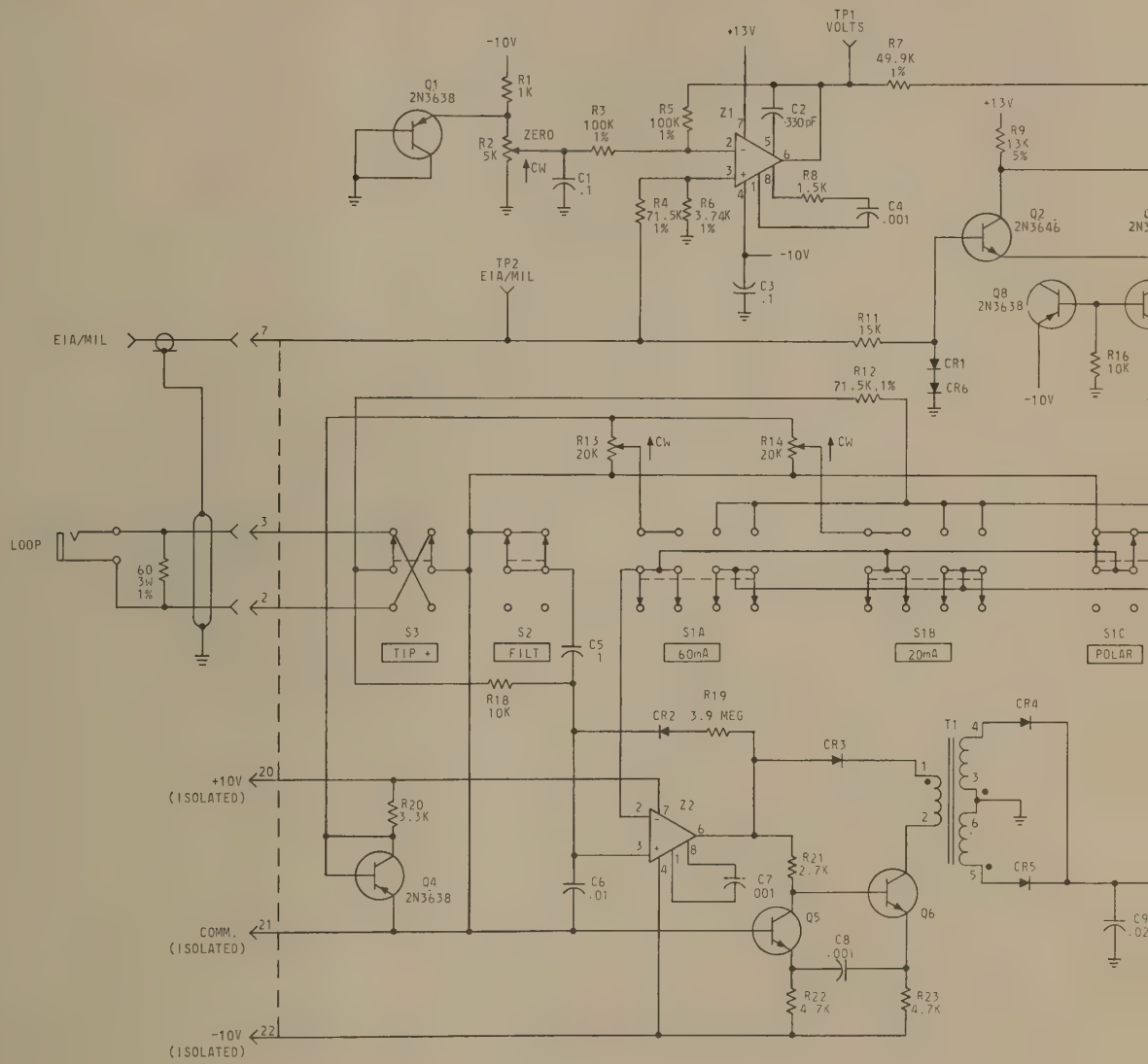
ATLANTIC RESEARCH CORPORATION
TELEPRODUCTS DEPT
A DIVISION OF THE SUSQUEHANNA CORP
ALEXANDRIA VIRGINIA 22314

PRINTED CIRCUIT BOARD ASS'Y
DC-1 DQA-10

CODE IDENT NO.	SIZE		REV
95335	D	TP-AD-41885690	B LTR

SCALE 2/1 SHEET 1 OF 1

-	TP-FA-41872690	690
DASH NO.	NEXT ASSEMBLY	PROJECT
APPLICATION		



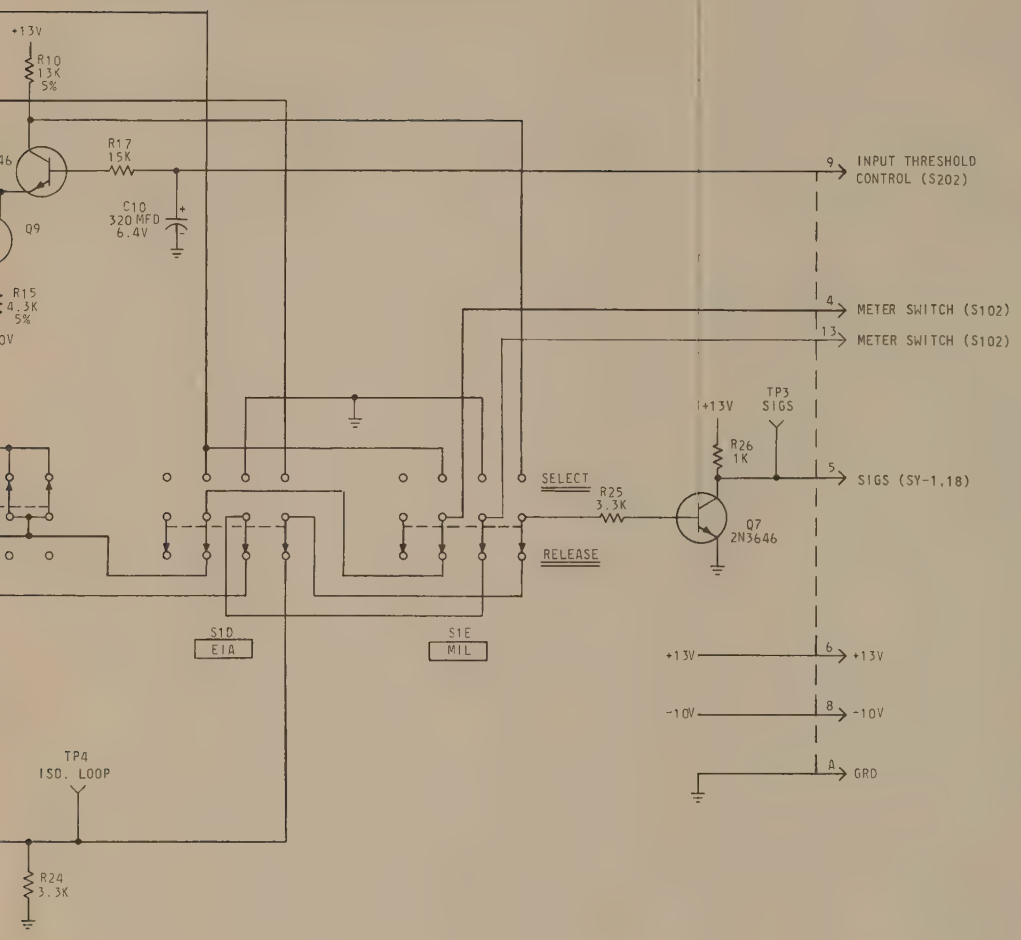
NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   - A. ALL TRANSISTORS ARE 2N3567.
   - B. ALL RESISTANCE VALUES ARE IN OHMS, 1/4W, ±10%.
   - C. ALL CAPACITANCE VALUES ARE IN MICROFARADS.
   - D. ALL DIODES ARE 1N914.
   - E. ALL INTEGRATED CIRCUITS ARE LM709.
2. S1A THRU S1E IS A MECHANICALLY INTERLOCKED SWITCH, S1C IS SHOWN IN THE ENERGIZED POSITION (PUSHED IN).
3. S2 AND S3 ARE INDEPENDENT PUSH ON,PUSH OFF SWITCHES, BOTH SHOWN IN THE ENERGIZED POSITION (PUSHED IN).

2 1

REVISIONS					
SYM	DESCRIPTION	DATE	BY	CHK	APPD

D C B A



QTY REQD	PART OR IDENTIFYING NO.	ITEM NO.	DESCRIPTION	REF DESIG	MANUFACTURER

LIST OF MATERIALS OR PARTS LIST

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES.
TOLERANCES:
ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
SURFACE ROUGHNESS
DO NOT SCALE DRAWING
MATERIAL:

APPROVAL	BY	DATE
DRAWN	E Vinson	11/01/70
CHECKED	[illegible]	6-3-70
ENGRG	W Hendley	6-4-70
PROJ ENGRG	[illegible]	6-5-70
STRESS		

APPROVED FOR ATLANTIC RESEARCH NAME DATE 19
APPROVED NAME DATE 19

ATLANTIC RESEARCH CORPORATION
TELEPRODUCTS DIVISION
ALEXANDRIA, VIRGINIA

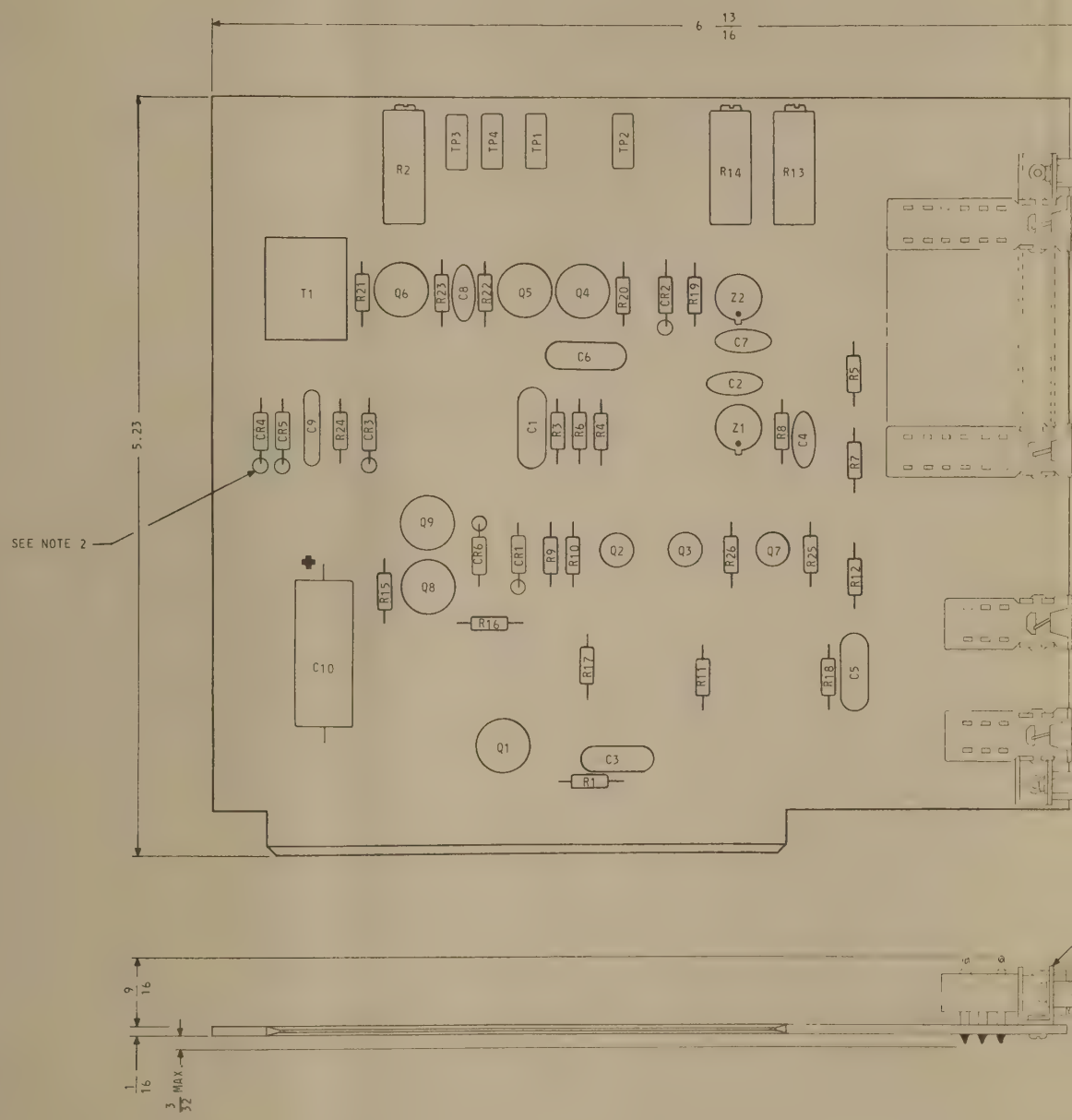
SCHEMATIC DIAGRAM
LI-1 DQA-10

CODE IDENT NO.	SIZE		REV
95335	D	TP-SD-41878690	- LTR

SCALE: NONE SHEET 1 OF 1

DASH NO.	NEXT ASSEMBLY	PROJECT
APPLICATION		

2 1



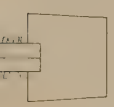
NOTES:

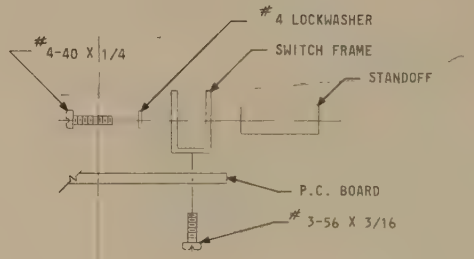
1. ALL DIMENSIONS ARE REFERENCE
2. CIRCLE ○ INDICATES CATHODE END OF DIODE.

2 1

REVISIONS					
SYM	DESCRIPTION	DATE	BY	CHK	APPD

SEE DETAIL "A"





DETAIL "A"

QTY REQD	PART OR IDENTIFYING NO.	ITEM NO.	DESCRIPTION	REF DESIG	MANUFACTURER

LIST OF MATERIALS OR PARTS LIST

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES:
ANGLES ± —
FRACTIONS ± —
2 PLACE DECIMALS ± —
3 PLACE DECIMALS ± —
SURFACE ROUGHNESS √
DO NOT SCALE DRAWING

APPROVAL	BY	DATE
DRAWN	E Johnson	2/2 11/70
CHECKED		6/4/70
ENGRG		6/4/70
PROJ ENGRG		6-5-70
STRESS		

APPROVED FOR ATLANTIC RESEARCH _____ NAME _____ DATE 19__
APPROVED _____ NAME _____ DATE 19__

ATLANTIC RESEARCH CORPORATION
TELEPRODUCTS DEPT.
A DIVISION OF THE SUSQUEHANNA CORP
ALEXANDRIA, VIRGINIA - 22314

PRINTED CIRCUIT BOARD ASS'Y
LI-1 DQA-10

CODE IDENT NO.	SIZE		REV
95335	D	TP-AD-41879690	— LTR

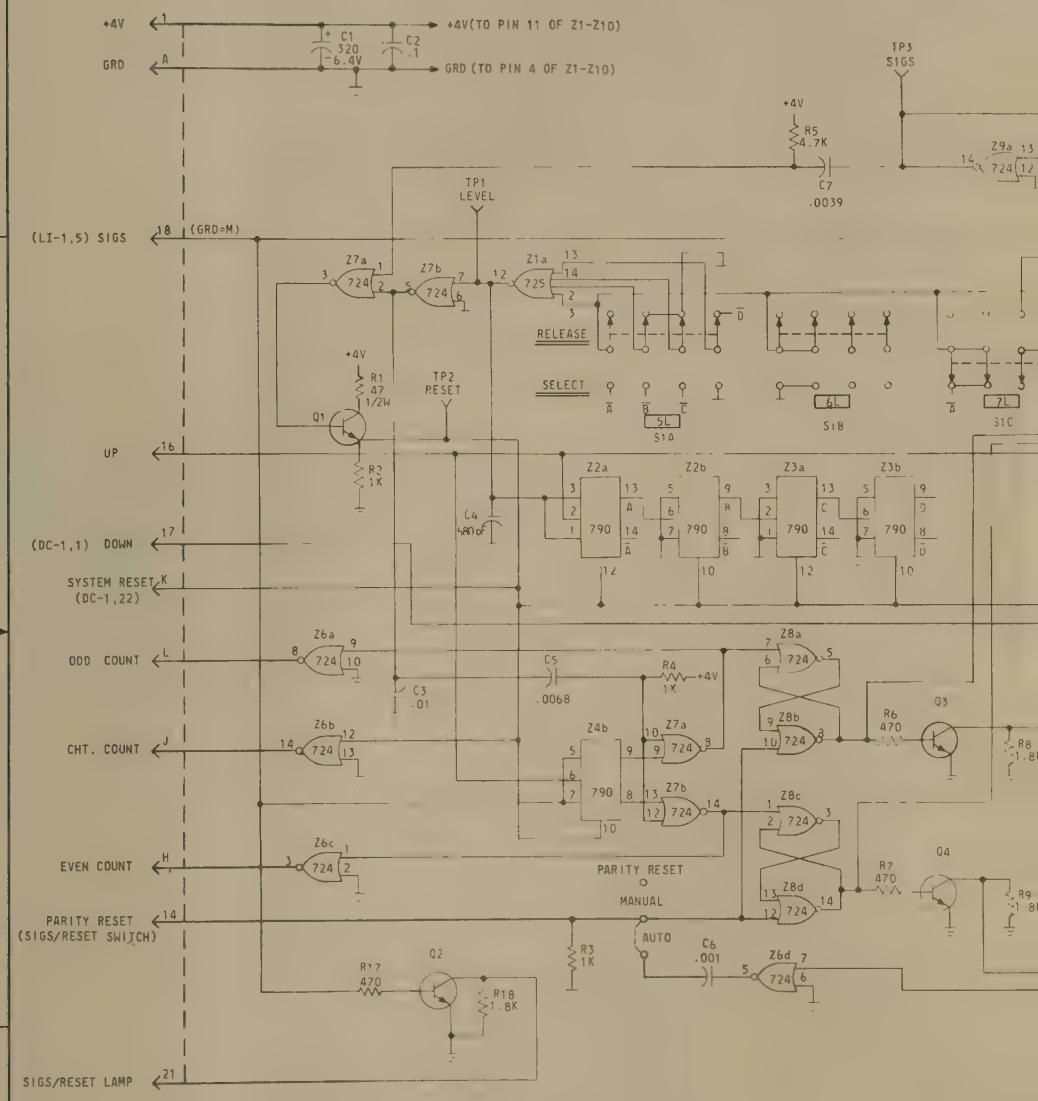
SCALE 2/1 SHEET 1 OF 1

MATERIAL: —

-	TP-FA-41872690	690
DASH NO.	NEXT ASSEMBLY	PROJECT
APPLICATION		

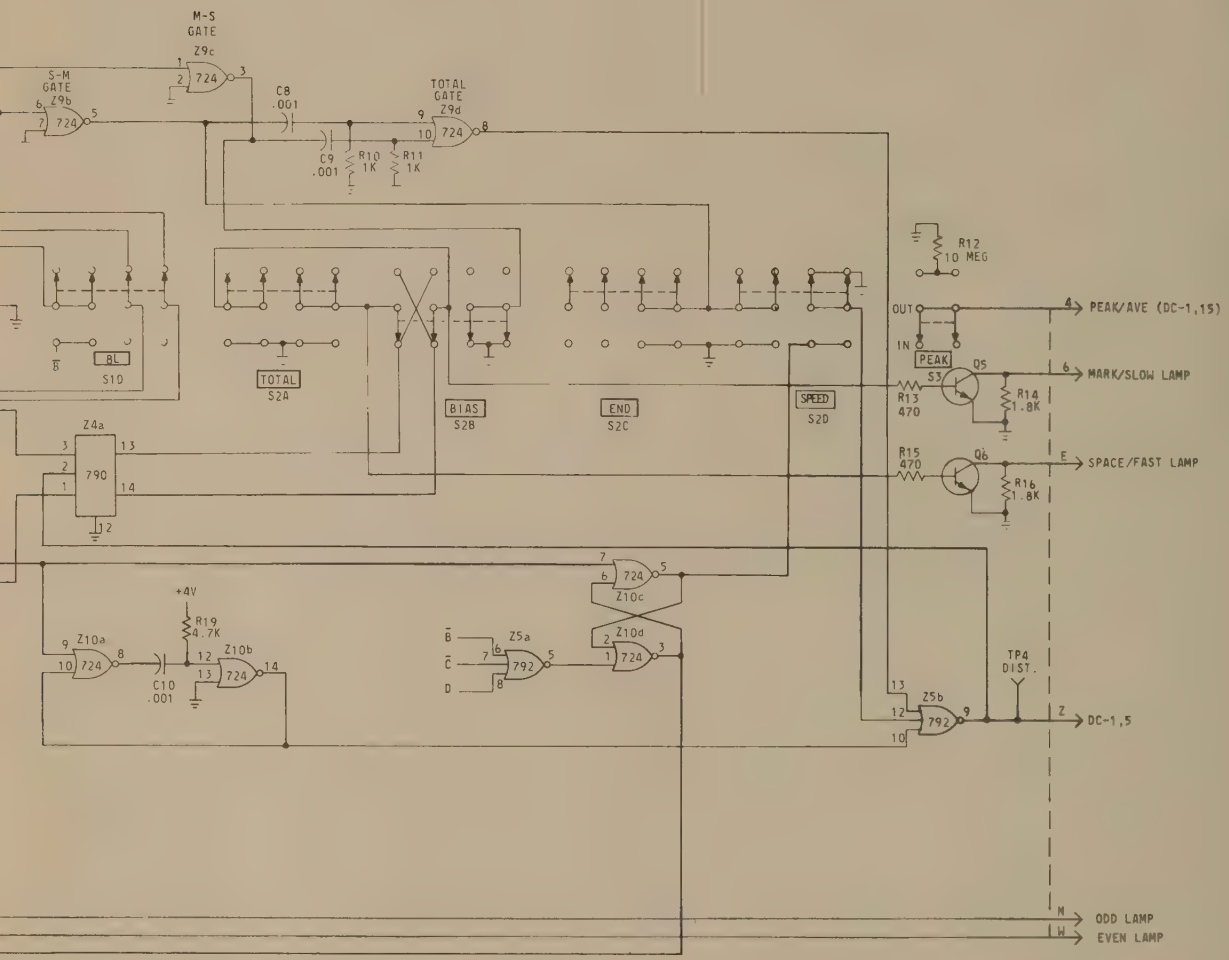
D C B A

2 1



NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   - A. ALL TRANSISTORS ARE 2N3567.
   - B. ALL RESISTANCE VALUES ARE IN OHMS, 1/4W, ±10%.
   - C. ALL CAPACITANCE VALUES ARE IN MICROFARADS.
2. S1 & S2 ARE LATCH INTERLOCK SWITCHES. S3 IS PUSH-ON, PUSH-OFF.



REVISIONS

SYM	DESCRIPTION	DATE	BY	CHK	APPD

QTY REQD	PART OR IDENTIFYING NO.	ITEM NO.	DESCRIPTION	REF DESIG	MANUFACTURER

LIST OF MATERIALS OR PARTS LIST

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES.
TOLERANCES:
ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
SURFACE ROUGHNESS
DO NOT SCALE DRAWING
MATERIAL:

APPROVAL	BY	DATE
DRAWN		11/26/69
CHECKED		1-29-70
ENGRG		6-4-70
PROJ ENGRG		6-5-70
STRESS		

APPROVED FOR ATLANTIC RESEARCH
NAME DATE 19
APPROVED
NAME DATE 19

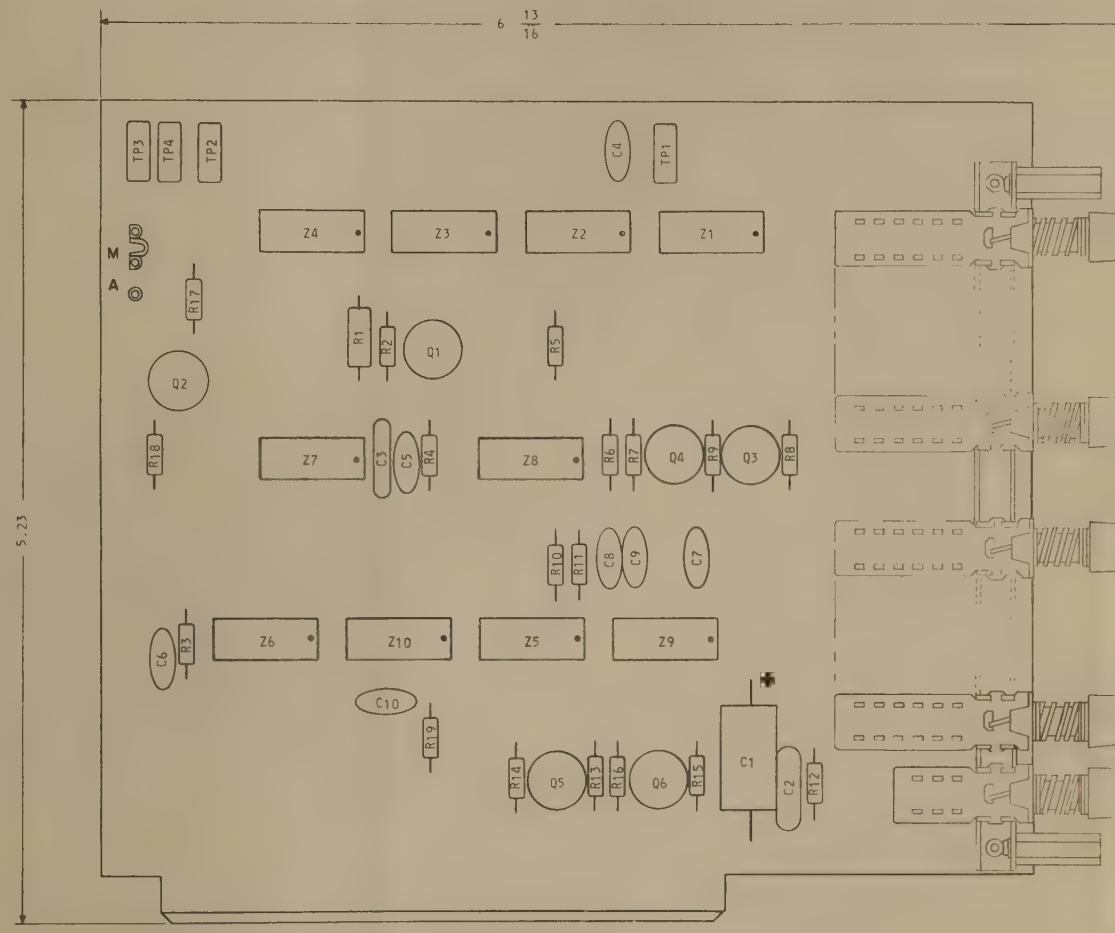
ATLANTIC RESEARCH CORPORATION
TELEPRODUCTS DIVISION
ALEXANDRIA, VIRGINIA

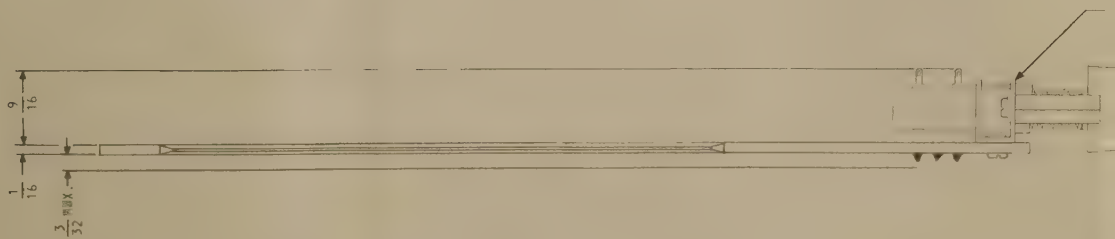
SCHEMATIC DIAGRAM
SY-I DQA-10

CODE IDENT NO.	SIZE		REV
95335	D	TP-SD-41881690	— LTR

SCALE NONE SHEET 1 OF 1

DASH NO.	NEXT ASSEMBLY	PROJECT
APPLICATION		

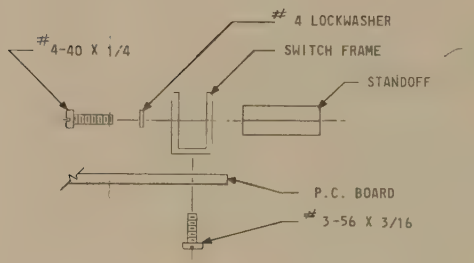




NOTES:

1. ALL DIMENSIONS ARE REFERENCE.

REVISIONS					
SYM	DESCRIPTION	DATE	BY	CHK	APPD



DETAIL "A"

E DETAIL "A"

QTY REQD	PART OR IDENTIFYING NO.	ITEM NO.	DESCRIPTION	REF DESIG	MANUFACTURER

LIST OF MATERIALS OR PARTS LIST

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES.
TOLERANCES:
ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
SURFACE ROUGHNESS √
DO NOT SCALE DRAWING
MATERIAL:

APPROVAL	BY	DATE
DRAWN	E. Vinson	2/24/70
CHECKED	H	6/3/70
ENGRG		
PROJ ENGRG		6 5 70
STRESS		

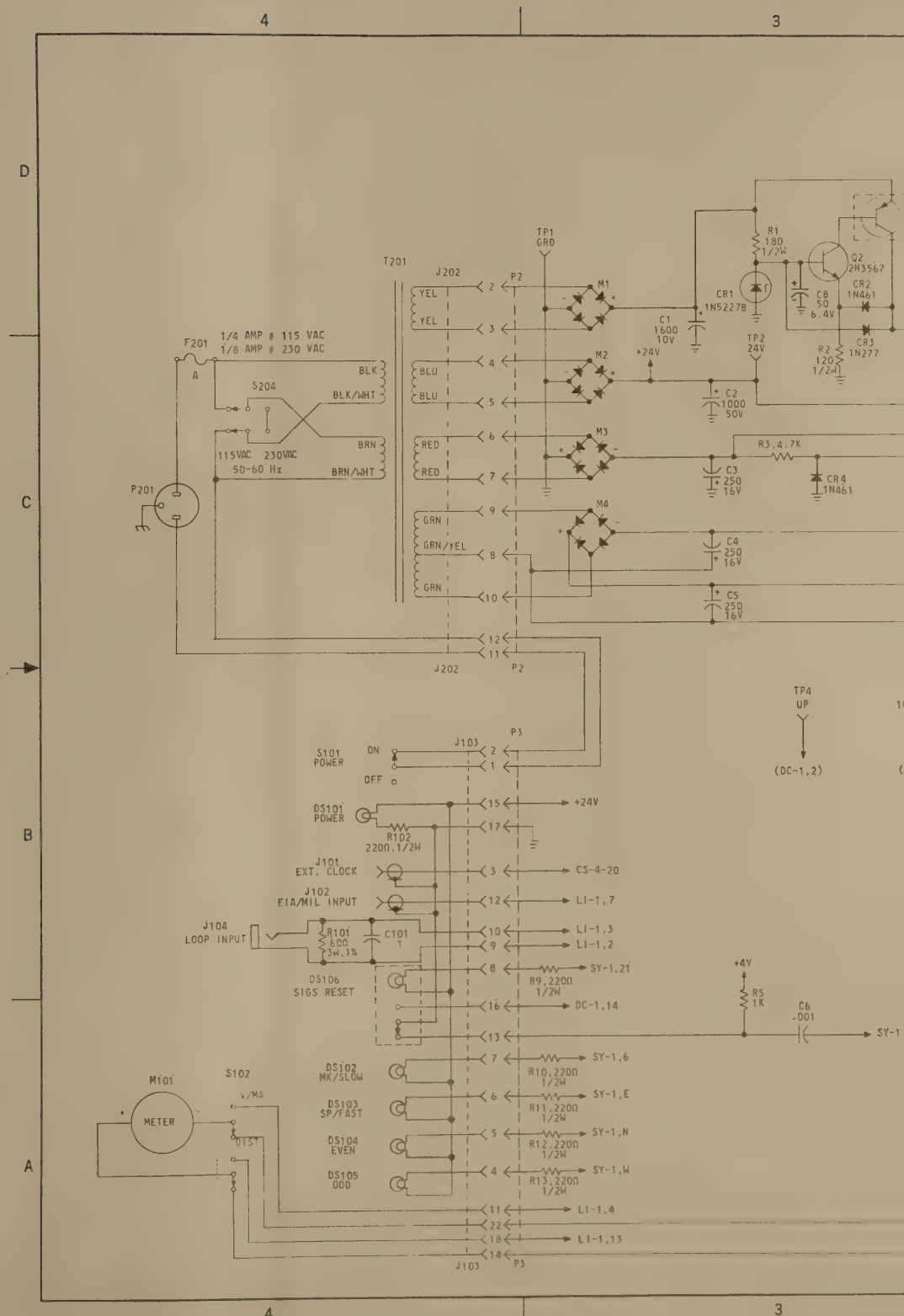
APPROVED FOR ATLANTIC RESEARCH _____ 19__
NAME DATE
APPROVED _____ 19__
NAME DATE

ATLANTIC RESEARCH CORPORATION
TELEPRODUCTS DEPT
A DIVISION OF THE SUSQUEHANNA CORP
ALEXANDRIA, VIRGINIA - 22314

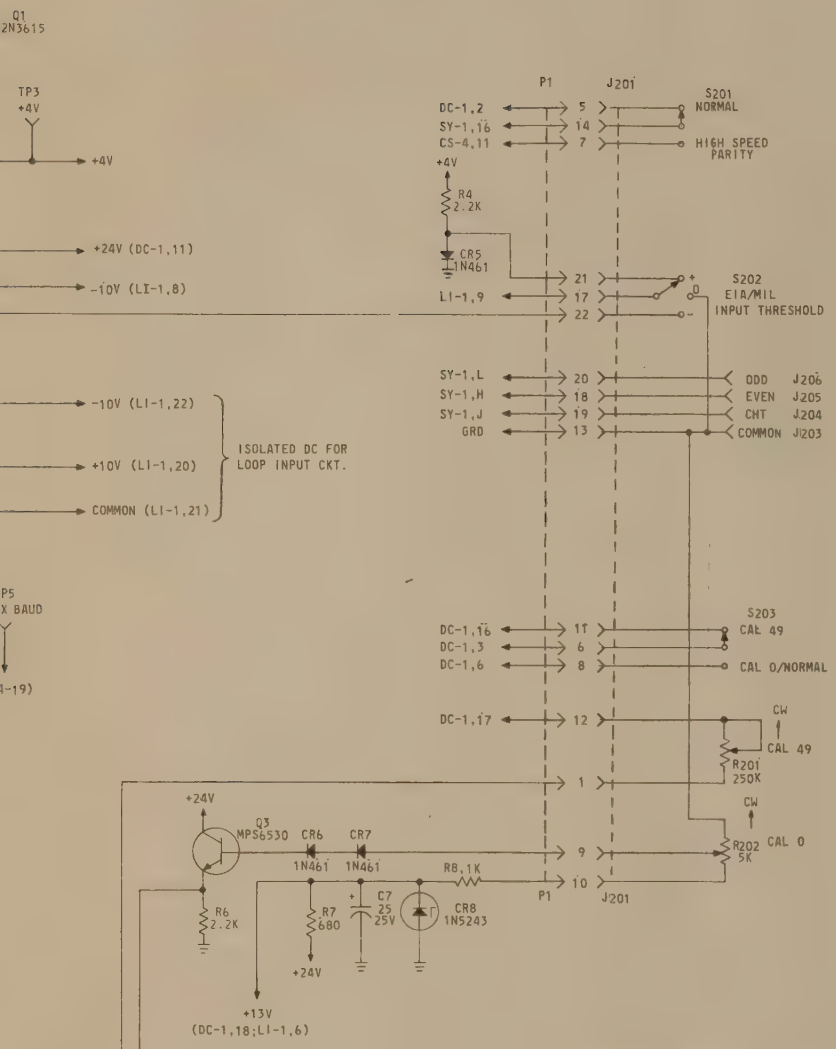
PRINTED CIRCUIT BOARD ASS'Y
SY-I DQA-10

CODE IDENT NO.	SIZE		REV
95335	D	TP-AD-41882690	—
		SCALE 2/1	LTR SHEET 1 OF 1

-	TP-FA-41872690	690
DASH NO	NEXT ASSEMBLY	PROJECT
APPLICATION		


4
3
D
C
B
A
T201
J202
P2
TP1
GRD
YEL
YEL
BLU
BLU
RED
RED
GRN
GRN/YEL
GRN
M1
M2
M3
M4
C1
1600
10V
+24V
TP2
24V
R1
180
1/2W
Q2
2N3567
CR1
1N5227B
C8
50
6.4V
CR2
1N461
CR3
1N277
R2
120
1/2W
C2
1000
50V
R3, 4.7K
C3
250
16V
CR4
1N461
C4
250
16V
C5
250
16V
F201
1/4 AMP @ 115 VAC
1/8 AMP @ 230 VAC
S204
BLK
BLK/WHT
BRN
BRN/WHT
115VAC 230VAC
50-60 Hz
P201
TP4
UP
(DC-1,2)
J103
P3
S101
POWER
ON
OFF
DS101
POWER
R102
220Ω,1/2W
+24V
J101
EXT. CLOCK
CS-4-20
J102
EIA/MIL INPUT
LI-1,7
J104
LOOP INPUT
R101
60Ω
3W,1%
C101
1
LI-1,3
LI-1,2
DS106
SIGS RESET
SY-1,21
R9,220Ω
1/2W
DC-1,14
+4V
R5
1K
C6
.001
SY-1
M101
METER
S102
V/MA
DIST
DS102
MK/SLOW
DS103
SP/FAST
DS104
EVEN
DS105
ODD
SY-1,6
R10,220Ω
1/2W
SY-1,E
R11,220Ω
1/2W
SY-1,N
R12,220Ω
1/2W
SY-1,W
R13,220Ω
1/2W
LI-1,4
LI-1,13

REVISIONS					
SYM	DESCRIPTION	DATE	BY	CHK	APPD
A	ADDED C101 & C7 POLARITY SYMBOL. EN 1093 & 1121	9-30-70	E.V.		
B	CR1 WAS 1N5228. ADDED C8. EN 1278	10-12-7	E.V.		



NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   - A. ALL RESISTANCE VALUES ARE IN OHMS, 1/4W, ±10%.
   - B. ALL CAPACITANCE VALUES ARE IN MICROFARADS.

QTY REQD	PART OR IDENTIFYING NO.	ITEM NO.	DESCRIPTION	REF DESIG	MANUFACTURER

LIST OF MATERIALS OR PARTS LIST

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES.
TOLERANCES
ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
SURFACE ROUGHNESS
DO NOT SCALE DRAWING
MATERIAL

APPROVAL	BY	DATE
DRAWN	E.V. Vinson	2/26/70
CHECKED		6-3-70
ENGRG	W. Hardin	6-4-70
PROJ ENGRG		6-5-70
STRESS		

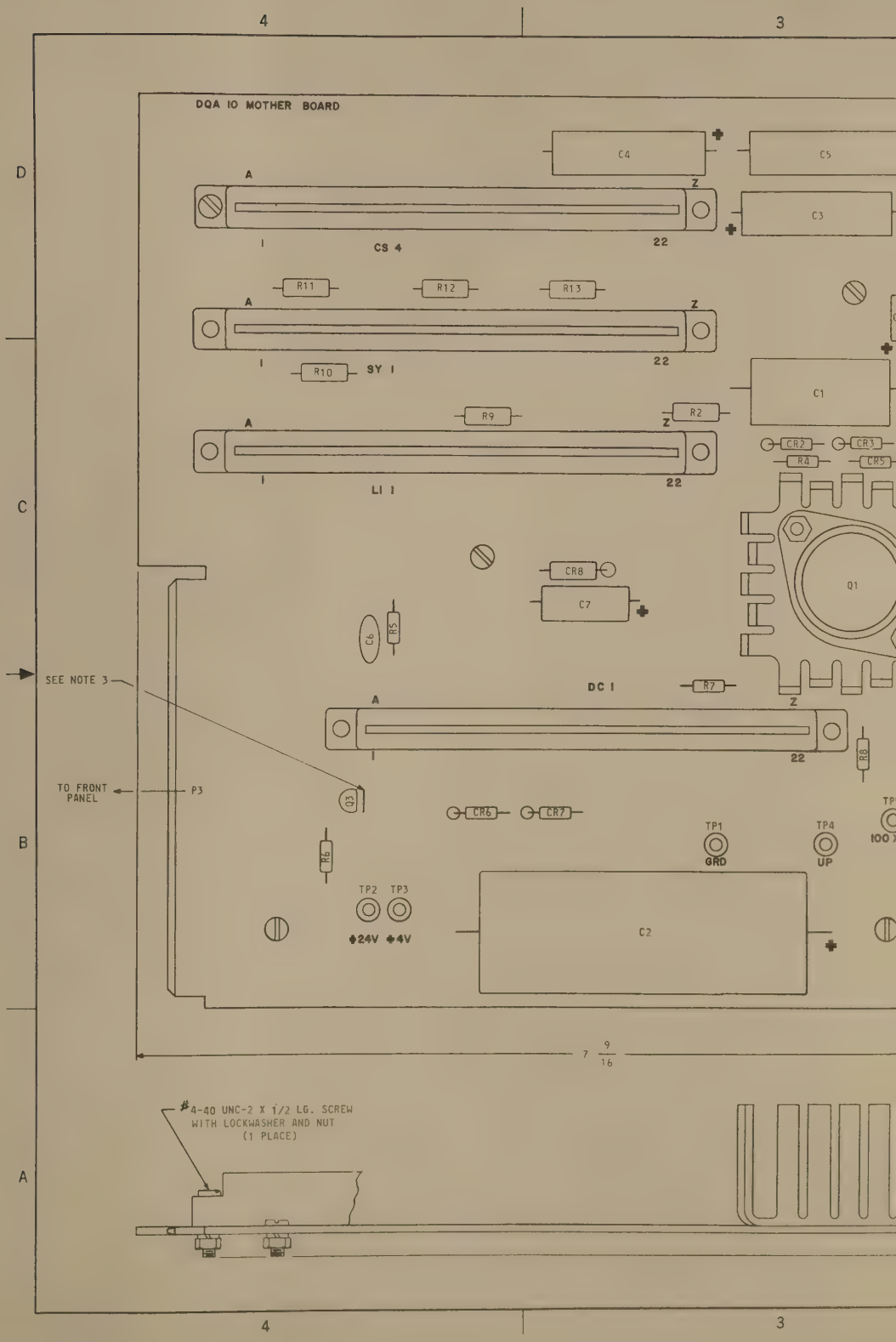
APPROVED FOR ATLANTIC RESEARCH
NAME DATE 19
APPROVED
NAME DATE 19

ATLANTIC RESEARCH CORPORATION
TELEPRODUCTS DEPT.
A DIVISION OF THE SUSQUEHANNA CORP
ALEXANDRIA, VIRGINIA 22314

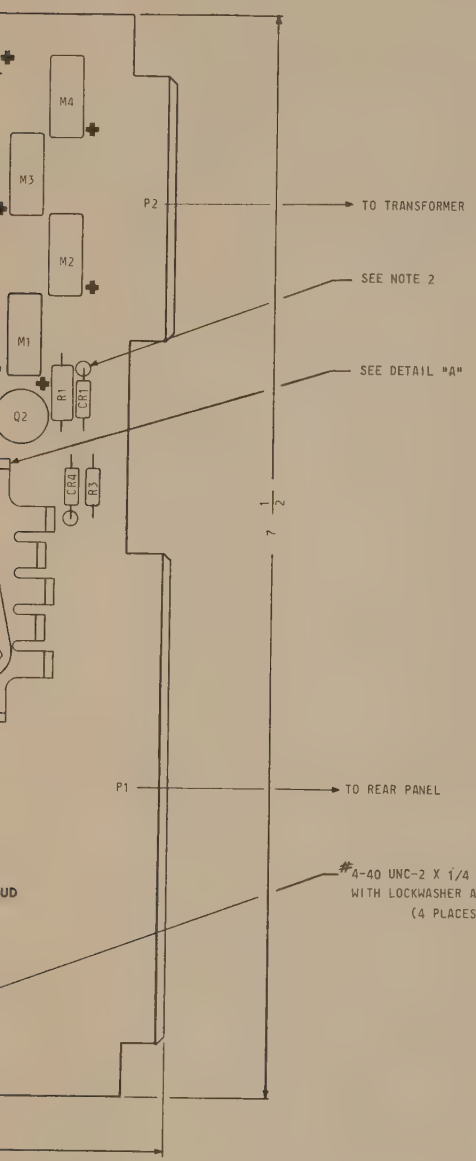
SCHEMATIC DIAGRAM
MOTHER BOARD
DQA-10

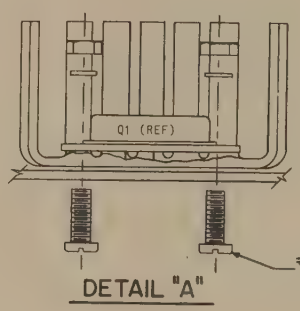
DASH NO.	NEXT ASSEMBLY	PROJECT
APPLICATION	690	

CODE IDENT NO.	SIZE		REV
95335	D	TP-SD-41875690	B LTR
SCALE —			SHEET 1 OF 1


DQA IO MOTHER BOARD
C4
C5
C3
A
Z
1
22
CS 4
R11
R12
R13
R10
SY 1
C1
R9
R2
CR2
CR3
R4
CR5
LI 1
Q1
CR8
C7
C6
R5
SEE NOTE 3
DC 1
R7
R8
TO FRONT PANEL
P3
Q3
CR6
CR7
TP1
GRD
TP4
UP
R6
TP2
TP3
+24V
+4V
C2
7 9/16
#4-40 UNC-2 X 1/2 LG. SCREW WITH LOCKWASHER AND NUT (1 PLACE)

REVISIONS					
SYM	DESCRIPTION	DATE	BY	CHK	APPD
A	ADDED POLARITY SYMBOLS TO C2, C7, & CR8. EN 1121	9-10-70	E.V.	[illegible]	AGQ
B	ADDED C8. EN 1278	10/19/71	EVV	GWJ	[illegible]

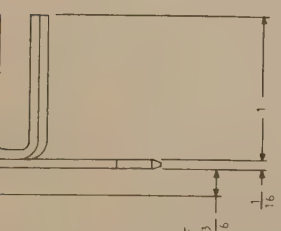




DETAIL "A"

NOTES:

1. ALL DIMENSIONS ARE REFERENCE.
2. CIRCLE ○ INDICATES CATHODE END OF DIODE.
3. FLAT SIDE OF TRANSISTOR MUST FACE REFERENCE LINE ON P.C. BOARD.



QTY REQD	PART OR IDENTIFYING NO.	ITEM NO.	DESCRIPTION	REF DESIG	MANUFACTURER

LIST OF MATERIALS OR PARTS LIST

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES.
TOLERANCES:
ANGLES ±
FRACTIONS ±
2 PLACE DECIMALS ±
3 PLACE DECIMALS ±
SURFACE ROUGHNESS
DO NOT SCALE DRAWING
MATERIAL:

	APPROVAL	BY	DATE
	DRAWN	E.Vinson	2/26/70
	CHECKED	[illegible]	6-3-70
	ENGRG	[illegible]	6-4-70
	PROJ ENGRG	[illegible]	6-5-70
	STRESS		

APPROVED FOR ATLANTIC RESEARCH — NAME — DATE — 19
APPROVED — NAME — DATE — 19

ATLANTIC RESEARCH CORPORATION
TELEPRODUCTS DEPT
A DIVISION OF THE SUSQUEHANNA CORP.
ALEXANDRIA, VIRGINIA - 22314

PRINTED CIRCUIT BOARD ASS'Y
MOTHER BOARD
DQA-10

CODE IDENT NO.	SIZE		REV
95335	D	TP-AD-41876690	D LTR

SCALE · 2/1 — SHEET 1 OF 1

-	TP-FA 41872690	690
DASH NO	NEXT ASSEMBLY	PROJECT
APPLICATION		

65 3 1
64 32 8 2

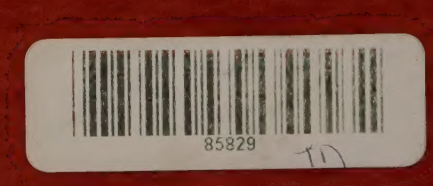
1 3 56 104

ACCOPRESS®

25970	YELLOW
25971	BLACK
25972	LIGHT BLUE
25973	DARK BLUE
25974	LIGHT GRAY
25975	LIGHT GREEN
25976	DARK GREEN
25977	TANGERINE
25978	RED
25979	EXECUTIVE RED

GENUINE PRESSBOARD

ACCO USA, INC.
770 S. ACCO PLAZA
WHEELING, IL 60090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